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THE JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND

INCLUDING

THE FARMER'S GUIDE TO AGRICULTURAL RESEARCH

VOLUME 95

(BEING THE NINETY-FIFTH VOLUME ISSUED SINCE THE FIRST PUBLICATION OF THE JOURNAL IN 1839)

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TABLE OF CONTENTS.

VOLUME 95, 1934.

SPECIAL ARTICLES.

RESEARCH WORK BY THE SOCIETY.

THE FARMER'S GUIDE TO AGRICULTURAL RESEARCH IN 1933.

CONTEMPORARY AFFAIRS.

OFFICIAL REPORTS.

APPENDIX.

Binding of Back Volumes of the Journal.

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New Numbers	Old Numbers
	FIRST SERIES
Vol. 1. 1839–40	Vol. I. Parts I. (i.), II. (ii.), III. (iii.), and IV. (iv.)
,, 2. 1841..	,, II. ,, I. (v.), II. (vi.) & III. (vii.)
,, 3. 1842..	,, III. ,, I. (viii.), II. (ix.), & III. (x.)
,, 4. 1843..	,, IV. ,, I. (xi.) and II. (xii.)
,, 5. 1844..	,, V ,, I. (xiii.) and II. (xiv.)
,, 6. 1845..	,, VI. ,, I. (xv.) and II. (xvi.)
,, 7. 1846..	,, VII. ,, I. (xvii.) and II. (xviii.)
,, 8. 1847..	,, VIII. ,, I. (xix.) and II. (xx.)
,, 9. 1848..	,, IX. ,, I. (xxi.) and II. (xxii.)
,, 10. 1849..	,, X. ,, I. (xxiii.) and II. (xxiv.)
,, 11. 1850..	,, XI. ,, I. (xxv.) and II. (xxvi.)
,, 12. 1851..	,, XII. ,, I. (xxvii.) and II. (xxviii.)
,, 13. 1852..	,, XIII. ,, I. (xxix.) and II. (xxx.)
,, 14. 1853..	,, XIV. ,, I. (xxxi.) and II. (xxxii.)
,, 15. 1854..	,, XV. ,, I. (xxxiii.) and II. (xxxiv.)
,, 16. 1855..	,, XVI. ,, I. (xxxv.) and II. (xxxvi.)
,, 17. 1856..	,, XVII. ,, I. (xxxvii.) and II. (xxxviii.)
,, 18. 1857..	,, XVIII. ,, I. (xxxix.) and II. (xl.)
,, 19. 1858..	,, XIX. ,, I. (xli.) and II. (xlii.)
,, 20. 1859..	,, XX. ,, I. (xliii.) and II. (xliv.)
,, 21. 1860..	,, XXI. ,, I. (xlv.) and II. (xlvi.)
,, 22. 1861..	,, XXII. ,, I. (xlvii.) and II. (xlviii.)
,, 23. 1862..	,, XXIII. ,, I. and II. (xlix.)
,, 24. 1863..	,, XXIV. ,, I. (l.) and II. (li.)
,, 25. 1864..	,, XXV. ,, I. (lii.) and II. (liii.)
	SECOND SERIES
Vol. 26. 1865..	Vol. I. Parts I. (i.) and II. (ii.)
,, 27. 1866..	,, II. ,, I. (iii.) and II. (iv.)
,, 28. 1867..	,, III. ,, I. (v.) and II. (vi.)
,, 29. 1868..	,, IV ,, I. (vii.) and II. (viii.)
,, 30. 1869..	,, V. ,, I. (ix.) and II. (x.)
,, 31. 1870..	,, VI. ,, I. (xi.) and II. (xii.)
,, 32. 1871..	,, VII. ,, I. (xiii.) and II. (xiv.)
,, 33. 1872..	,, VIII. ,, I. (xv.) and II. (xvi.)
,, 34. 1873..	,, IX. ,, I. (xvii.) and II. (xviii.)
,, 35. 1874..	,, X. ,, I. (xix.) and II. (xx.)
,, 36. 1875..	,, XI. ,, I. (xxi.) and II. (xxii.)
,, 37. 1876..	,, XII. ,, I. (xxiii.) and II. (xxiv.)
,, 38. 1877..	,, XIII. ,, I. (xxv.) and II. (xxvi.)
,, 39. 1878..	,, XIV. ,, I. (xxvii.) and II. (xxviii.)
,, 40. 1879..	,, XV. ,, I. (xxix.) and II. (xxx.)
,, 41. 1880..	,, XVI. ,, I. (xxxi.) and II. (xxxii.)
,, 42. 1881..	,, XVII. ,, I. (xxxiii.) and II. (xxxiv.)
,, 43. 1882..	,, XVIII. ,, I. (xxxv.) and II. (xxxvi.)
,, 44. 1883..	,, XIX. ,, I. (xxxvii.) and II. (xxxviii.)
,, 45. 1884..	,, XX. ,, I. (xxxix.) and II. (xl.)
,, 46. 1885..	,, XXI. ,, I. (xli.) and II. (xlii.)
	SECOND SERIES—*continued.*
Vol. 47. 1886 .	Vol. XXII. Parts I. (xliii.) and II. (xliv.)
,, 48. 1887..	,, XXIII. ,, I. (xlv.) and II. (xlvi.)
,, 49. 1888..	,, XXIV. ,, I. (xlvii.) and II. (xlviii.)
,, 50. 1889..	,, XXV. ,, I. (xlix.) and II. (l.)
	THIRD SERIES
Vol. 51. 1890..	Vol. I. Parts I. (1), II. (2), III. (3), & IV. (4)
,, 52. 1891..	,, II. ,, I. (5), II. (6), III. (7), & IV. (8)
,, 53. 1892..	,, III. ,, I. (9), II. (10), III. (11), & IV. (12)
,, 54. 1893..	,, IV. ,, I. (13), II. (14), III. (15), & IV. (16)
,, 55. 1894..	,, V. ,, I. (17), II. (18), III. (19), & IV. (20)
,, 56. 1895..	,, VI. ,, I. (21), II. (22), III. (23), & IV. (24)
,, 57. 1896..	,, VII. ,, I. (25), II. (26), III. (27), & IV. (28)
,, 58. 1897..	,, VIII. ,, I. (29), II. (30), III. (31), & IV. (32)
,, 59. 1898..	,, IX. ,, I. (33), II. (34), III. (35), & IV. (36)
,, 60. 1899..	,, X. ,, I. (37), II. (38), III. (39), & IV. (40)
,, 61. 1900..	,, XI. ,, I. (41), II. (42), III. (43), & IV. (44)
,, 62. 1901	Issued as an Annual Bound Volume.
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,, 68. 1907..	Issued as an Annual Volume in paper covers.
,, 69. 1908..	Issued as an Annual Volume in paper covers.
,, 70. 1909..	Issued as an Annual Volume in paper covers.
,, 71. 1910..	Issued as an Annual Volume in paper covers.
,, 72. 1911..	Issued as an Annual Volume in paper covers.
,, 73. 1912..	Issued as an Annual Bound Volume.
,, 74. 1913..	Issued as an Annual Bound Volume.
,, 75. 1914..	Issued as an Annual Bound Volume.
,, 76. 1915..	Issued as an Annual Volume in paper covers.
,, 77. 1916..	Issued as an Annual Volume in paper covers.
,, 78. 1917..	Issued as an Annual Volume in paper covers.
,, 79. 1918..	Issued as an Annual Volume in paper covers.
,, 80. 1919..	Issued as an Annual Volume in paper covers.
,, 81. 1920..	Issued as an Annual Volume in paper covers.
,, 82. 1921..	Issued as an Annual Volume in paper covers.
,, 83. 1922..	Issued as an Annual Volume in paper covers.
,, 84. 1923..	Issued as an Annual Volume in paper covers.
,, 85. 1924..	Issued as an Annual Volume in paper covers.
,, 86. 1925..	Issued as an Annual Volume in paper covers.
,, 87. 1926..	Issued as an Annual Volume in paper covers.
,, 88. 1927..	Issued as an Annual Volume in paper covers.
,, 89. 1928..	Issued as an Annual Volume in paper covers.
,, 90. 1929..	Issued as an Annual Volume in paper covers.
,, 91. 1930..	Issued as an Annual Volume in paper covers.
,, 92. 1931..	Issued as an Annual Volume in paper covers.
,, 93. 1932..	Issued as an Annaul Volume in paper covers
,, 94. 1933..	Issued as an Annual Volume in paper covers.
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THE JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND

THE AGRICULTURAL POLICY IN ACTION.

In the Society's Journal last year there appeared a very full and clear exposition of the legislation enacted by the National Government for the reorganisation of agricultural marketing.* In the present article the steps that have been taken by the industry with the facilities thus provided are described, along with an account of other legislation enacted in pursuance of the national policy and some discussion of the questions which it has raised in operation.

Historically, the Agricultural Marketing Act, 1931, introduced by Dr. Addison and passed by the Labour Government, marks the first step, but, as is well known, the farming industry felt that the facilities which it gave them for organising the marketing of their commodities were useless without the control of competing imports. It is interesting, therefore, to record that the first and only commodity for which a marketing scheme was introduced and a marketing board set up under Dr. Addison's Act, was hops, and home-grown hops were already protected by a heavy import duty equivalent to something like 50 per cent. *ad valorem*.

The Import Duties Act, 1932.

One of the earliest measures enacted by the National Government affecting agriculture was the Import Duties Act, 1932. The purposes of this Act were so to restrict imports as to provide a remedy where a foreign country discriminated against British goods, and to increase the public revenue. A great range of agricultural and horticultural products are

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* *The Agricultural Marketing Act*, 1933. A. W. Street. Vol. 94, 1933, pp. 1–21.

affected by it, most of them of a luxury or semi-luxury character, such as flowers, hot-house fruits and early fruits and vegetables. The farm crops most affected, perhaps, were potatoes and oats. While the duties imposed in the early months of the year may not have done much to assist the clearance of the British maincrop potato supplies, the trade in early potatoes received some benefit from the duty of £2 a ton which ran during July and August 1933. The duty on foreign oats is £3 a ton, and on oatmeal it is £7 10*s*. 0*d*. a ton. Imports of both have declined substantially.

On the other hand, it must be recorded that the scope of the Import Duties Act extends far beyond agriculture. In the interests of British manufacturers, it imposes duties on farm machinery and many farming requisites of foreign manufacture, and it would be impossible at present to attempt to balance the advantages and disadvantages accruing to farmers under the operation of the Act. It is fair to say, however, that if there have been complaints about the cost of certain requisites, they have not been serious, whereas the benefits of the duties, particularly to growers of horticultural products, are widely acknowledged.

The Import Duties Act was a measure of general protection. The first particular legislation passed for farmers by the National Government followed with the Wheat Act, 1932, which was introduced by Sir John Gilmour. Following the immense world harvest of 1928 and the economic crisis, first in America and later in this country, the price of wheat had fallen to levels not touched for forty years. Arable farming was severely depressed; indeed, but for the beet sugar subsidy, which had given many farmers a profitable root crop, the crisis in the Eastern counties would have been almost disastrous. Ever since the repeal of the Agriculture Act, 1920, one of the objects of which was to secure to wheat growers the return, at least, of their costs of production, farmers had been asking for some other form of guarantee, and when wheat was selling at little more than a pound a quarter, the demand became insistent.

The Wheat Act, which was passed in response to this demand, is a measure of considerable ingenuity. It was recognised that as home production of the commodity is only about one-fifth of the national requirements, an import duty on wheat and flour sufficient to be effective in raising the price of British wheat would put a heavy tax upon the consumer. And so the Government resolved upon a scheme which makes up to home producers the difference between the average market price for wheat and the figure of 10*s*. a cwt. At the same time, lest this price should stimulate wheat production unduly, the

quantity on which the full subsidy would be payable was fixed by the Act at 27 million hundredweight, so that any quantity produced in excess of this amount would reduce, proportionately, the effective price to each grower.

It is not necessary here to go into the details of the Act. It is sufficient to record that from the wheat-growers' standpoint it has been an unqualified success, and that the maximum production on which the full subsidy is payable was exceeded within two years, so that the sum actually received by growers for the 1933 crop was 42*s*. 8*d*. instead of the nominal 45*s*. The Act has aroused, however, a good deal of criticism amongst farmers and others who are not wheat growers, and this must be considered.

The criticism comes mainly from those who are anxious to plan the national industry along those lines of production in which they consider that it enjoys certain natural advantages. They argue that corn is essentially a product for mass production in prairie countries, that it is easily stored without deterioration, and that it lends itself to cheap transportation, in all of which Britain has no advantage and even suffers under certain definite handicaps. Further, they point to the gross returns of British agriculture and argue that as wheat makes only a very small contribution to the total, wheat-growing is not worth encouragement.

No one will quarrel with the desire to plan our national agriculture. It is this that lies behind the new national policy. But the planners who criticise the so-called wheat policy are surely misled by the statistics which they quote, for while it is true that wheat may form only a small percentage of the total agricultural output, it may be all-important in certain districts and on particular farms. Indeed, over large areas in the arable counties, a wheat policy is just as necessary as is a beef policy over large areas in the grass counties, and as soon as Britain was committed to the protection of its agriculture there could be no reasonable complaint against the principles of the Wheat Act, so long as it can be regarded as only one step in a comprehensive policy.

The Agricultural Marketing Act, 1933.

The next step followed in July 1933, when Mr. Elliot's Agricultural Marketing Act of that year reached the Statute Book. Whereas Dr. Addison's Act had made it possible for the majority of the producers of any agricultural commodity to control the methods by which that commodity should be sold, Mr. Elliot's Act strengthened their hands very greatly in that, for the first time, it made it possible for them to control im-

ports. Ever since the introduction of the Bill which emerged as the Act of 1931, farmers had protested that any organisation of the home supply would be useless in the absence of control of competing imports. It is doubtful, however, whether they realised that control might sometimes have to go further than this in certain commodities, if it were to be effective in regulating prices, and that restriction of output might have to be applied to the home producer as well. Powers to control home production are given by Mr. Elliot's Act, and they have been already applied.

Under the provisions of the Marketing Acts, 1931 and 1933, the producers of four commodities—milk, bacon pigs, potatoes and hops—have formed Marketing Boards to regulate the distribution of them.

Milk.

The Milk Marketing Board for England and Wales was brought into operation in October 1933. The scheme which it had to operate was the outcome of the consideration by Parliament of one that had been presented to the Minister of Agriculture by the National Farmers' Union in April of that year, and it was based upon the Report of the Reorganisation Commission for Milk, with certain modifications.* The Board is a party to the sale of the whole of the milk marketed in England and Wales, which approaches 1,000 million gallons a year, with a weekly turnover of more than a million pounds. Each producer is free to arrange his contract of sale with any buyer, but only upon standard conditions laid down by the Board. One of these is that the buyer shall make payment to the Board direct, and the Board settles with the producer after deduction of the expenses of the Board, carriage of milk and sometimes of a levy for the equalisation of prices between districts. Producer-retailers must be licensed by the Board to sell, and they may not undercut the agreed retail price of their district. The Board has powers to enforce the observance of this agreed retail price and it has exercised them. Producer-retailers must also contribute a levy upon their gallonage, which goes towards the equalisation of district prices.

It is an obligation upon every producer to do his best to find a market for his milk, but should he then fail to procure a contract, the Board must find him a market or, anyhow, pay him for his milk.

Wholesale prices are fixed by agreement between the Milk Marketing Board and the trade, or in the absence of agreement, by arbitrators. The principle upon which prices are fixed is to

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* *Report of the Reorganisation Commission for Milk.* Ministry of Agriculture Economic Series No. 38.

take advantage of the home producers' monopoly of the market for milk for liquid consumption so as to get as high a price as can be got for it without reducing consumption, and to sell the milk that is used in manufacture for such prices as it will fetch having regard to the competition of overseas milk products which it has to face. Clearly, the buyer of milk to be used for the production of cream will not pay more than a price which will enable him to sell his cream in competition with Irish and other imported supplies. The manufacturer of milk chocolate will divert his orders to imported dried milk if the price of liquid rises beyond a certain figure. Cheese manufactured from British milk has to compete in the open market with New Zealand and Canadian, and this determines the price which the cheese manufacturer can pay for milk, and the price of milk used for butter-making is controlled by similar competition.

The result of this arrangement is a great range of wholesale prices dependent upon the uses to which the milk is to be put. But whatever the farmer's contract may be, that is to say whether he sells his output to a milk distributor at the highest price, or to a cheese manufacturer at the lowest, the Milk Board averages all the contracts in each of the twelve regions into which it divides the country, and every farmer is paid at the average rate of his district. A levy may be made on producers in those zones where liquid sales predominate, so as to assist the price in other zones where the large proportion of manufactured milk depresses the average price. And by an arrangement which Mr. Elliot announced early in the summer of 1934, the Treasury will make a contribution by way of loan to the Milk Marketing Board to maintain the price of the cheapest milk at certain minimum figures.

This organisation of the sale of milk has already had definite results, and its effects on the dairying industry, as time goes by, may be very considerable. Under the conditions which prevailed until the autumn of 1933, producers could be divided into three classes, according to the nature of their sales. There were those who, from their favourable position for the market and from their highly efficient organisation as producers of level supplies of high-quality milk, contracted for practically the whole of their output at the full liquid price. There were others who sold varying percentages of their production at the liquid price, and took the cheese price for the rest of it. And there were those, mainly producers of summer milk in districts remote from an industrial demand, who sold the bulk of their output at whatever price the manufacturers would pay.

Under the operations of the Milk Marketing Scheme, all these classes of producer have their sales bulked in each zone, and each of them gets the same price. Equality of treatment

is the fundamental principle of the organisation brought into being by the Agricultural Marketing Acts, and it calls upon those who were exceptionally favoured, sometimes by circumstances, sometimes, it must be said, by their own exceptional ability, to sacrifice something in the general interest. It was the anticipation of this result which led to the farmers' criticism of Dr. Addison's Act, and it was to meet this criticism that Mr. Elliot's Act took powers to control the volume of production, whether imported or native, so as to make it possible to maintain the average price at a profitable level.

In the milk industry, however, much of the competition which the Milk Marketing Board has to meet comes from the Dominions, and up to the present time negotiations with the Dominions to bring about some restriction of production so as to raise prices have not been brought to a successful issue. The result is that milk for manufacture commands relatively a low price, and those who formerly enjoyed a partial monopoly of the liquid market have to be content with a lower figure when their sales are averaged with others, while, at the same time, those who until a year ago had to be content with the world price for sales mainly of manufacturing milk, are now enjoying a much more satisfactory return

The question for the future, clearly, is how to maintain the average price at a figure which will recompense producers whose costs of production are high, without stimulating such a flow of milk from the districts where cheaper production is possible and where lower prices have hitherto prevailed, as will inevitably bring down the pool average prices everywhere. Already this situation is presenting itself acutely to one of the Scottish Milk Boards. Milk produced in the warm and wet south-western corner of Scotland, much of which went formerly into cheese manufacture, is now available in quantities sufficient, probably, for the whole of the liquid requirements of consumers in the area covered by the Board, to the discomfiture of the producers in the regions of higher costs further east who formerly had something of a monopoly of their local market. The situation which is developing, and the ultimate solution of it, should prove of great interest to English milk producers, for it is a situation which may also arise in England before long. In proportion as the average price paid to producers mainly of manufacturing milk shows an improvement on the prices they got before the application of the Scheme, so the production of milk by them may be expected to increase. Unless the consumption of liquid milk can be stimulated, the result must be the depression of pool prices.

In the meantime, it can be claimed for the Milk Marketing Board that it has introduced a great revolution into milk

marketing methods with extraordinary smoothness and lack of friction, and that without it the industry would probably have experienced the complete collapse of collective bargaining which, indeed, had virtually overtaken it before the Board was brought into being.

It must not be supposed that the activities of the Milk Board are limited to price fixing and to the collection of farmers' accounts for averaging and distribution. Naturally that has been the work which lay first to hand, and it cannot be expected that much more could be organised for so great an industry in a space of nine months. It should be recorded, however, that schemes are now well advanced both for increasing the consumption of liquid milk and for encouraging the production of milk of higher quality.

Bacon Pigs.

As a matter of history it may be noted that the Pigs Marketing Board and the Bacon Marketing Board came into operation a month before the Milk Marketing Board. While the Boards have no monopoly of any part of the bacon market resembling that enjoyed by milk for liquid consumption, they have an advantage over the Milk Board in that competing imports come almost entirely from foreign rather than from Dominion countries, and so are capable of regulation. The Pigs Marketing Board has taken full advantage of this situation. By estimating the normal bacon requirements of the nation, and by the introduction of the contract system, under which it is now possible to know the British output of bacon twelve months ahead, the Board can regulate the quantity of imports so that these, together with the home production, shall not exceed the estimated home consumption. This insures the bacon curer a market for his produce.

As to prices payable to the producer, the scheme employed for the first contract period was based upon the cost of an agreed ration of feeding stuffs. It is known that a well-bred pig, fed with reasonable efficiency, will turn a given quantity of food into a given quantity of meat with almost mathematical precision, and it was arranged that the price to be paid by the factories to the pig-feeder, so as to give him his production costs plus a reasonable profit, was to move up and down with the average price during the preceding four months of the agreed feeding ration.

At the same time, the importance of quality, if English bacon curers were to satisfy the consumer long accustomed to the high standards of Danish bacon, was recognised by providing a grading system for carcases. Five grades were instituted for each of three weight classes with a difference of half-a-crown

a score between the best and the worst. It is very noteworthy that feeders are now giving far more attention to the standards of excellence laid down by the curers, and thick shoulders now come in for more criticism than the placing of a stripe, while the prolificacy of a strain is recognised as of more account than showyard points.

After the first contract period, which expired in the spring of 1934, the basis of payment to farmers was varied. Owing to a sudden fall in the bacon market during the first contract period, curers found themselves faced with a loss on their product which was made good to them by a loan granted under the provisions of the Agricultural Marketing (No. 2) Act, 1933, which, indeed, was passed to meet this emergency, although its powers are general and do not apply to the Bacon Marketing Board alone. The amount advanced to the curers, £160,000, is now being repaid by a levy on the producers contracting for the second period, and the whole of it must be repaid by the same process within two years. To prevent the recurrence of such a situation, the basis of payment to the producer has now been varied so as to make him a participator in the fortunes of the bacon factories. A formula is used to calculate the monthly price for feeders, which takes into account the average price of foods during the previous four months and also the wholesale price of bacon during the previous month.

At the outset, the Pigs Marketing Scheme promised to be an outstanding success. More than twice the anticipated number of pigs were offered for the first contract period, and the powers of the Ministry were at once evoked to impose a rigid control of imports. For the second period, however, some difficulty was experienced in getting the requisite quantity of pigs. The effect of concentration by many producers on the bacon market during the first period had been to enhance the price of pork, which rose far beyond its baconer parity. Some feeders were tempted to switch over to the fresh pork market; others disliked having to contract in definite numbers for ten months ahead; while others, again, were dissatisfied with the change in the basis of payment. In the result, a sufficient number of pigs had not been promised when the closing date for the new contracts arrived, in February, 1934, and the period had to be extended. It was pointed out by the Minister of Agriculture that quantitative regulation of imports would be rendered very difficult if the home production were to be subject to irregularities, and that under the Marketing Acts farmers had it in their power to secure the whole of the bacon market for themselves to the exclusion of all foreign bacon.

At the time of writing, arrangements are in hand for the contracts for the twelve months beginning 1st January, 1935. There is a certain amount of dissatisfaction with the price basis, caused partly, no doubt, by the levy in force for repayment of curers' losses during the first contract period. Some producers, too, object to the profit-sharing arrangement and desire a return to the cost-of-production principle. The future is not too clear, but the complete control of the market which producers enjoy should make it possible for the Board to arrive at a satisfactory understanding with the curers. There is room for an immense expansion of the bacon industry of this country, though whether this can be achieved in a controlled market for bacon pigs alongside an uncontrolled pork market remains to be seen. Another factor, of course, is the purchasing power of the consumer, indeed it is the most important of all. In Scotland, a rise of 3*d.* a pound in the price of gammon of bacon was attributed by retailers to the resumption of work on the Giant Cunarder, and the increased demand for "gammon rashers". It is the object of all the new policy for agriculture to raise farmers' prices. It was anticipated that this might be achieved, in part, by the greater efficiency of the new selling organisation, but if it can be secured only by a substantial rise in retail prices, the consumer may be driven to find cheaper alternative foods. It has been suggested that the rise in the price of bacon during the past twelve months has increased the demand for eggs, corned beef and other substitutes. This is a matter which no doubt is receiving the careful attention of the Pigs and Bacon Marketing Boards.

Potatoes.

Like the Pigs Marketing Scheme, the Potato Marketing Scheme which came into force under the Potato Marketing Board at the end of 1933, is devised to offer to the wholesaler quantities sufficient for the consumers' demand and no more. It differs both from the Pigs Marketing Scheme and the Milk Marketing Scheme in that there is no intervention by the Board between the grower and the distributor, except that sales by dealers on commission have recently been abolished and all sales must be between principals. There is, however, a good deal of control of imports, particularly of first earlies, and there are duties on imports under the Import Duties Act.

As to home production, an acreage quota has been determined for every grower, based on an average of his acreage in recent years, and he is debarred from exceeding that quota except on payment to the Board of a sum of £5 for each additional acre. Similarly, no new grower may enter the industry,

to produce potatoes for sale, except by the previous payment of £5 an acre for each acre planted, in return for the allocation of a quota of that extent.

Each year the Board proposes to estimate the national yield of ware potatoes at lifting time, and upon that estimate the volume of potatoes coming on to the market is to be regulated by the simple expedient of dictating the size of the riddle over which the potatoes must be passed. For the present season all potatoes offered for sale must have passed over a 1½-in. riddle.

Notwithstanding statements about the effect of dumping, the import statistics prove conclusively that British growers of maincrop potatoes have suffered very little, in the past, from external competition. Prices have fluctuated upwards or downwards mainly under the influence of the size of the home-grown crop. It is from competition amongst themselves more than from foreign competition that the potato growers' Board will interfere to save growers, and the acreage quota and the size of the riddle are the Board's machinery. At the same time, there have been seasons when the imports of maincrop potatoes from Holland, Germany and other countries have exerted a depressing effect, more by their influence on merchants' and farmers' psychology than by their actual volume. Some twelve years ago, the Agricultural Tribunal of Investigation considered the problem, and, remarking that in most seasons the home supplies are sufficient and in some seasons in excess of the home demand, the Tribunal recommended "that imports of foreign potatoes be permitted only under general licence of the President of the Board of Trade, for specified periods, after consultation with the Minister of Agriculture as to the extent of home supplies."[1]

No action was taken on this recommendation, which is probably long forgotten, but recently (September, 1934) the machinery of the Agricultural Marketing Act, 1933, was put in motion, and an Order has been made which prohibits the importation of maincrop potatoes from abroad except under licence of the Board of Trade. With information available of the acreage planted with potatoes each year and of the probable yield, the Potato Board is now in a position to exercise effective control of supplies.

It must be admitted that the doctrine of the restriction of food production in the interests of the farmer is repellent to many, and it is for the Potato Marketing Board to show, by its wisdom in the exercise of its powers, that the fears of dear food and scarcity are groundless.

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[1] Agricultural Tribunal of Investigation. *Interim Report*, p. 7. Cmd. 1842. 1923.

Hops.

The story of the organisation of hop marketing under the new facilities is perhaps the most interesting of all. During the war and for seven years afterwards, all hops were marketed under a Government control which, it may be noted, was probably the most successful of all the experiments in State trading. It satisfied producers and consumers alike, and it cost the country nothing. So successful was it that growers representing some 90 per cent. of the industry decided upon its continuance, on a voluntary basis, when the State enterprise came to an end in 1925. Had Dr. Addison's Marketing Act been conceived at that time, all would have been well, for English Hop-growers Ltd. represented growers far in excess of the two-thirds majority which that Act requires before complete control over all producers can be assumed. In the absence of powers to bring a recalcitrant minority into line, this voluntary association failed. Bumper crops which the brewing industry could not absorb led to dissatisfaction amongst some of the growers whose output could not all be sold, and the experience of those who have tried to organise the co-operative distribution of agricultural commodities upon a voluntary basis was now repeated as, one by one, the members were tempted to break away, in order to enjoy a temporary advantage at the expense of their fellow members. English Hop-growers Ltd. was wound up and the hop market went to pieces.

The Agricultural Marketing Act, 1931, gave the more far-seeing amongst hop-growers, and these were the great majority, their opportunity. They knew that collective marketing could be conducted successfully when all were compelled to co-operate, and they had proved that without compulsion full co-operation could not be secured. Moreover, English hops enjoyed protection in the shape of a heavy import duty on foreign hops, so that the farmers' general criticism of the Addison Act, to the effect that it controlled the home producer while leaving his over-seas competitor free, had no bearing. A Hops Marketing Scheme was prepared, submitted and approved, and the Hops Marketing Board was set up in time for the first hop crop, that of 1932, to be picked after the passing of the Act.

The hop crop of 1932 was of unusually high quality. On top of this the repeal of prohibition in America was shortly expected, which would diminish the import of American hops, and a reduction in the beer duty in the Budget of 1933 was confidently awaited, which would increase the demand for beer. All these factors put the Hops Marketing Board in a very strong bargaining position, and prices were fixed for the various qualities of hops which gave growers an average of £8 *5d. 0d.* a

cwt., representing something like a 100 per cent. advance on the ruinous figures which had prevailed since the breakdown of English Hop-growers Ltd.

In 1933, the position of the Hops Marketing Board was even stronger. Beer was now a legal drink in America, and the expected reduction in the excise duty had been made. The hop crop again was of very high quality. The Board took full advantage of its position, and fixed a scale of prices giving an average return of about £15 a cwt., which represented nearly 100 per cent. increase on the average of the previous year. The Brewers' Society lodged an objection to the new scale of prices on the grounds that they were excessive, but the objection, having been referred to the Committee of investigation, was over-ruled by that body, and the Board's prices were confirmed.

Nobody pretended that prices of this order were necessary if hop cultivation in this country was to continue. The Board's argument was that, with the return of the American demand, the world had been swept clean of hops, and that English growers were fully entitled to receive the world price. They had suffered enough from low world prices in recent years; why should they be prevented from recouping themselves by the action of their own Board? At the same time, the Board recognised that profits of the order of 100 per cent. and more would stimulate growers to extend their acreage and would bring back into the hop industry men who had gone out of it in the bad times. As the market for hops is limited by the demand for beer and there is no alternative use for them, the Board foresaw a time when it would have to accept hops which it could not sell. And so it approached the Government with an Amending Scheme under which it sought powers to allot individual selling quotas to all growers, which would prevent them from burdening the Board with hops in excess of the present production for the next five years. There was some opposition to the amendment, on the ground that it created a monopoly, but the brewers' objections were waived, after consideration by a joint committee of brewers and growers, by a guarantee that there should be no repetition of the scale of prices demanded in 1933, and the scheme received Parliamentary approval.

Control of production of hops for sale is now absolute, for there is not even a loop-hole, in the shape of a fine, for the extension of existing gardens or for the entry of new growers, such as is provided by the Potato Marketing Scheme.

The prices to be paid during the next five years are calculated to give the grower his costs of production and a 20 per cent. profit. The effect of the Scheme is, of course, to give a

special value to all those farms which have received a quota allocation.

No other marketing boards have been set up under the Agricultural Marketing Acts, but action under them has been taken which concerns fat stock, eggs and poultry, and home-grown sugar.

Fat Stock.

An Agricultural Marketing Reorganisation Commission for fat stock was set up under the provisions of the Addison Act at the end of 1932. It is not surprising that the complexity of the subject referred to it occupied the Commission for a long time, and its report was not issued until the spring of 1934.[1] The Report covers a wide field, but upon the principal point its recommendations may be summed up in the abolition of the sale of fat stock on the hoof at many markets in favour of centralised slaughter at a comparatively few points, and sale by grade and description.

The Report was not given a very warm welcome by the fat stock interests, and the National Farners Union have not, so far, submitted any scheme for the marketing of fat stock, based upon it, to the Minister of Agriculture. Upon the question of centralised slaughter divergent views are held. It must be clear to every student of marketing that in many of the little markets with which the country is besprinkled, the sale of fat stock can only be conducted at excessive expense and under conditions which tend to eliminate competition amongst buyers. While sales in the large central markets are carried on with much greater efficiency, and have their advocates who claim that this method is the best that can be devised, there are still those who maintain that fat cattle should never enter a market of any kind. They hold that to handle fat stock efficiently there must be a well-organised system of slaughter-houses where cattle can be killed, carcases graded and by-products processed. In the absence of any general concensus of opinion on one side or the other, fat stock marketing continues for the present in its old unorganised state.

In the meantime, while there has been some improvement in the wholesale prices of mutton and lamb, the trade in fat cattle has gone from bad to worse, notwithstanding agreements with the principal importing countries for the quantitative regulation of imports of beef. And so, shortly before the House rose for the summer vacation in 1934, Mr. Elliot announced that a subsidy of 5*s.* a cwt. would be paid on all fat cattle marketed

[1] *Report of the Marketing Reorganisation Commission for Fat Stock.* Ministry of Agriculture Economic Series No. 39.

between the 1st September and 31st March following. This represents a bonus of about £2 10*s.* 0*d.* per beast, and farmers are duly grateful. But while it may help them in the coming months to secure better returns, it does nothing to show how to put the bullock feeding industry on its feet again, which is a problem as far from solution as ever.

Eggs and Poultry.

In October 1933 the Minister of Agriculture constituted an Agricultural Marketing Reorganisation Commission for Eggs and Poultry under the Acts of 1931 and 1933. It is pleasant to record that Mr. Elliot invited his predecessor at the Ministry —Dr. Addison—to be Chairman. The Commission is expected to report in the Autumn of 1934.

Home-grown Sugar.

Under the Agricultural Marketing Acts it is not necessary that the appointment of a Reorganisation Commission should precede the formulation of a marketing scheme for an agricultural commodity. The sugar beet industry of this country has developed from nothing into a branch of agriculture of first-class importance during the past ten years, under the shelter of the Beet Sugar (Subsidy) Act, 1925. That Act was passed for ten years, and although its operation has been extended for one year, this was done only with the object of enabling growers and manufacturers to get together and evolve a scheme or schemes for the future control of the industry, under the Agricultural Marketing Acts. A scheme has been prepared and a public inquiry concerning it has been held. It has now to come before Parliament.

Summary.

From this brief summary of the Agricultural policy of the country, it is clear that, for the most part, the intention of the Government is to facilitate the organisation of distribution under schemes prepared by the farmers themselves, operated by Marketing Boards consisting for the most part of farmers. The methods sanctioned for the various commodities differ, but the commodities affected by the new national policy for agriculture and the methods of assistance applied to them fall into three main categories. In the first, there are those in which overseas competition can be controlled. Examples are provided by bacon, potatoes and hops. Overseas competition in this group comes almost exclusively from foreign countries, and there has been no difficulty in allocating quotas or in imposing tariffs or restrictions in some other form upon the quantity of

imports. Two dangers have to be avoided if the organisation of supply under this system is to succeed.

First, the home-produced article must be as good as that which was formerly imported. It should be noted, for example, that complaints are common enough about the quality of English bacon by contrast with Danish. British producers, however, are alive, as never before, to the importance of catering for the consumer's demand, and the proportion of bacon pigs graded at the factory in the highest class may be expected rapidly to increase. As regards hops, brewers need a proportion of foreign growths in the manufacture of certain qualities of beer, and the import of these under duty must be allowed. The earliest of early potatoes, too, do not compete with British earlies, nor do they come in quantities sufficient to make effective competition with the British maincrop on the market at the time of their arrival. If there is a demand for these flavourless tubers, there is no reason why the Government should not exploit it under a revenue-producing luxury tax.

Second, there must be no ground for any suggestion that supplies are being restricted to the consumers' detriment. Consumers of agricultural produce far outnumber producers, and when prices begin to rise, as rise they must if the new agricultural policy is to achieve its purposes, there is sure to be a searching scrutiny of all action which has been taken to restrict supplies, whether of imports or of home produce. The controllers of the new machinery must see to it that any steps taken by way of restriction of supplies will stand the most searching examination.

In the second category are those commodities which have to meet a form of overseas competition which cannot be controlled. In this class the products most concerned are milk manufactures and meat. Competition in these things comes almost exclusively from the Dominions or from debtor countries such as the Argentine and Brazil. Discrimination against the Dominions will always be difficult on sentimental grounds, and the Ottawa Agreements have put any such action out of court for the time being. There is a strongly expressed demand amongst farmers for a revision of these agreements at the earliest possible moment, and there have been dark hints even in official quarters as to what will happen on their expiry next year if voluntary restriction of exports, particularly of dairy products, is not agreed to by the Dominions in the meantime. The issue which looks so simple is really bound up in the whole complex system of international exchange. For years this country has been lending money to the Dominions, until the total debt to the mother country runs into many hundreds of millions. The interest on these debts is provided by the export

of agricultural produce to this country, and it is only by still further exports that the Dominions can make a market for British manufacturers. How then is it possible, quite apart from sentiment, to bring about any effective restriction of Dominion imports? "You can have the interest on your loans if you take our butter", said a member of the New Zealand delegation to the World Economic Conference to the writer, "or you can stop our butter and go without your interest". And omitting the sentimental considerations, the argument applies with equal force to the Argentine, and also to Brazil where the debt service has already been suspended, to the discomfiture of many British investors.

The future for commodities in this category is obscure. The subsidy for manufacturing milk is intended as a loan to be repaid by milk producers one day, and the subsidy outright for fat cattle is intended to be repaid from a levy to be arranged, at some future date, on imported meat. The only permanent cure for the present depression of both these commodities would seem to lie in increased purchasing power amongst consumers, in other words in the restoration of industrial prosperity. In the meantime, however, producers of fat cattle would be well advised to consider whether there is nothing more to be done to reduce the costs of distribution by the reform of existing marketing methods, whether, in short, there are no lessons to be learnt from the Report of the Reorganisation Commission for Fat Stock.

In the third category come those commodities which, although subject normally to severe competition from abroad, are now protected by special enactments. In this class conspicuously are wheat and sugar beet. There is no commodity in which competition from overseas is more severely felt at the present time than in wheat. No attempt has been made to restrict the import of it, nor has anything been done to raise the price by taxation. Steps have been taken by which the consumer of flour makes up the world price to a certain figure for a fixed maximum quantity of British Wheat. By more roundabout means, and at the expense of the tax-payer instead of that of consumers as a whole, sugar made from British-grown sugar beet is subsidised so that it may compete successfully with the West Indian cane and Continental beet sugar.

In conclusion the point must be emphasised that there can be no return to the old agricultural order. For better or worse, British agriculture is committed to a system of organisation and control which seems certain to restrain individual freedom of action more and more. Already no one not now a hop grower can plant a garden to produce hops for this market, nor may a successful grower extend his acreage; no one may grow more

potatoes or may begin to grow them for the first time without the payment of a fine. No one may sell milk at prices less than those sanctioned by the Marketing Board, and if the free market for pork gives the pig feeder some liberty of action still, this choice may not be left to him much longer.

For better or worse a new organisation is here, and the duty of the farmer is to make it effective. The scheme for bacon pigs should operate satisfactorily when its teething troubles are over, even though it be at the expense of Denmark. The potato and the hops schemes should restore prosperity to growers without ill consequences to other interests, if their Marketing Boards will use their monopolies with wisdom and restraint. The whole range of products sheltered under the Import Duties Act should enjoy additional success, for which, of course, the consumer must pay, but not necessarily exorbitantly. But for the great industries of dairying and meat, the outlook is more obscure. For these the restoration and maintenance of prosperity seems to be less under the control of the State or of the industries themselves but to depend in greater measure upon the restoration of economic equilibrium throughout the world.

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THIRTY YEARS OF GRASSLAND EXPERIMENTS AT SAXMUNDHAM, SUFFOLK.

In the Autumn of 1900 experiments in the manuring of semi-derelict grassland, for hay, were started on a field of poor heavy land at Saxmundham in East Suffolk. The soil is chalky boulder clay.

Professor (now Sir Thomas) Middleton (Ref. 1), reporting on these experiments in 1904, gave the following analysis of the soil of the adjoining field, on which rotation experiments are conducted :—

	Percentage in soil dried 100°C.
Organic matter and loss on ignition	5·79
Nitrogen	0·178
Lime	1·59
Phosphoric acid sol. in hydrochloric acid	0·218
Phosphoric acid sol. in 1 per cent. citric acid . .	0·0243
Potash sol. in hydrochloric acid	0·71
Potash sol. in 1 per cent. citric acid	0·002

"This analysis (said Professor Middleton) throws little light on the actual condition of the soil and from the above figures it would have been impossible to forecast, with any degree of accuracy, its manurial requirements. This soil, on which phosphates have exercised so great an influence, was supposed to be well supplied with phosphates until tested by experiment."

Early in 1921 analyses were made at the East Anglian Institute of Agriculture, Chelmsford, of the soil in two parts of the grass field (known as Fiske's field), with the following results :—

	Portion of field in manurial plots (Old grass not properly seeded down). %	Portion of field sown with different mixtures of grass seeds in 1903. %
Available potash	0·0234	0·0245
Available phosphate . . .	0·0110	0·0114
Nitrogen	0·266	0·302
Carbonate as calcium carbonate	0·29	0·144

Note.—The field was rented for the purpose of experiments by the East Suffolk County Council. The supervision of the plots was in the hands firstly of Mr. H. Fiske and afterwards of Mr. J. E. Smith—the School of Agriculture, Cambridge, taking an active interest in them. Since 1911 the writer of this report has been in charge. During the whole period the foreman, Mr. Chas. Cattermole, has done most of the practical work. The writer wishes to express his indebtedness, to all those mentioned, for their share in the work.

Another sample, taken along a pathway across the field, was found to contain 0·43 per cent. carbonate as carbonate of lime.

Section A.

Manurial Experiments on the semi-derelict portion of Fiske's Field.

The land now to be considered had never been properly laid down to grass; the seeds sown had not "taken" well and the pasturage was of a worthless character. The surface covering consisted chiefly of weeds, wild carrot being the most abundant species; there were a few coarse grasses, and a number of starved and diminutive plants of yellow "clover" (*Medicago lupulina*) and red suckling clover (*Trifolium minus*). There was also some white clover. The manures, as set out in Table I, were applied in the autumn and winter 1900–01.

The hay has been weighed every year from 1901 to 1933 (with three exceptions). The crop in 1901 was so poor as not to be worth weighing. Slight changes in the manurial treatment were made for the crop of 1908 and again for that of 1927, so that it is convenient to consider the results in three periods.

First Period, 1902–07. (*For details see Table* 1).

Effect of Phosphates. Truly remarkable results were given by all the manures containing phosphates. Small plants of wild white and red clover and other legumes were present at the time of application of the manures. The growth of these plants was encouraged to such an extent that in certain years the hay consisted largely of leguminous herbage. As Professor Middleton said (Ref. 1) "In the initial years the land, not having grown much clover for many years, specially favours the development of such plants. The clovers not only increase the hay crop but greatly improve the soil so that grasses begin to spread, and after a few years the quantity of grass as well as of clover is greatly increased".

It is of much importance to note that a heavy initial dressing of basic slag (10 cwt.) gave better results than two small dressings of 5 cwt. each.

Superphosphate, although costing more than slag, gave nearly as good a result as the heavy initial dressing of the latter manure and a better result than two small dressings of slag.

Dissolved bones containing both soluble phosphates and nitrogen also did well. This was strikingly true in the first year. The subsequent dressing of bone meal gave only a small return. All these manures, taking either the prices current at the time of application, or those at present ruling, gave very large profits, the highest profit being given by the single dressing of 10 cwt. of basic slag.

Effect of Potash. A small increase, 1·4 cwt. of hay per acre annually, was obtained by the application of 3½ cwt. of kainit twice in the period, as an addition to 7 cwt. super-phosphate

TABLE I.

EFFECT OF MANURES ON HAY CROPS AT SAXMUNDHAM, 1ST PERIOD, 1902-7.

Fiske's field (originally semi-derelict grass).
Figures per acre.

Plot (each ½ acre.)	Treatment.	Cost of Treatment.	Average weight of hay per acre for the 6 years 1902–7 inclusive.
		s. d.	cwt.
1	10 cwt. basic slag (1901)	24 0	32·0
2	5 cwt. basic slag (1901 and 1904) . .	24 0	27·1
3	7 cwt. superphosphate (1901 and 1904) .	36 0	31·4
4	Unmanured	—	10·1
5	7 cwt. superphosphate, 3½ cwt. kainit (1901 and 1904)	54 0	32·8
6	7 cwt. superphosphate, 10 cwt. lime (1901 and 1904)	64 0	33·9
7	7 cwt. superphosphate, 71 lb. sulphate of ammonia (1901 and 1904) . . .	52 0	34·9
8	6 cwt. dissolved bones (1901), 3½ cwt. bone meal (1904)	62 0	28·8

NOTES.—5 cwt. basic slag and 7 cwt. superphosphate each supplied 100 lb. phosphoric acid. Throughout the whole period of the experiment high-grade high-soluble slag was used. The superphosphate was 30–32%, 3½ cwt. kainit contained 50 lb. potash and 71 lb. sulphate of ammonia 14 lb. nitrogen. The years given in brackets are those in which the first crop was grown after manuring.

Effect of Nitrogen. A small dressing of sulphate of ammonia added to 7 cwt. of superphosphate twice in the 7 years increased the crop of hay by an average of 3·5 cwt. per acre.

Professor Middleton (Ref. 1) stated that the hay from this plot was not of as good quality as that from the basic slag.

Effect of Lime. Ten cwt. of lime as an additional dressing to 7 cwt. superphosphate, twice in the 7 years, produced an average increase of 2·5 cwt. of hay per acre per annum.

Second Period 1908–26. (*For details see Table II*).

Slight changes were introduced in the scheme of manuring. In order further to test the effect of potash, Plot 1 was split in two, half (Plot 1a) receiving a repetition of the initial dressing of 10 cwt. basic slag, whilst the other half received the same quantity of slag with kainit in addition. Plot 2 was also divided, half receiving a further 5 cwt. dressings of basic slag, with the addition of kainit at intervals, while the other half received the same quantity of slag and kainit with the addition of nitrate of soda at intervals.

Effect of Phosphates. Further dressings of 10 cwt. basic slag at intervals maintained the crop at a high average level compared with the unmanured plot. The crop on this plot

(1a) was not, however, nearly so heavy as that caused by the flush of clover following the initial dressing of slag in 1900. The character of the herbage varied from year to year. In some years it was very clovery, whilst in others grasses constituted a larger proportion. This was however the case with all the plots. Seven cwt. of superphosphate per acre applied to Plot 3 at intervals gave an average of 3 cwt. less hay per acre than the heavy slag on Plot 1a. It must be remembered, however, that although this plot received the same amount of phosphoric acid in the first period 1902–07, it has since then only received dressings in the same years as Plot 1, and hence has had only half the quantity of phosphoric acid. The results from this plot must therefore be regarded as very satisfactory, from the point of view of the efficiency of the phosphoric acid supplied.

Comparing Plots 1b and 2a we see that the larger quantity of slag applied per acre to plot 1b gave an average of 3·4 cwt. per acre more hay than the smaller quantity. Both Plots received the same quantity of kainit.

TABLE II.

EFFECT OF MANURES ON HAY CROPS AT SAXMUNDHAM,
2ND PERIOD, 1903–26.
Fiske's field (originally semi-derelict grass).
Figures per acre.

Plot.	Treatment.	Average weight of hay for the 17 years, 1909–26 inclusive. (No weighings 1908 and 1917.)
		Cwt.
1a	10 cwt. basic slag, 1901, 1907, 1912, 1915–16,* 1919–20, 1922–23	23·1
1b	10 cwt. basic slag, as plot 1a. 2 cwt. kainit, 1909, 1912, 1915–16, 1919–20, 1922–23 .	24·3
2a	5 cwt. basic slag, 1901, 1904, 1907, 2 cwt. kainit, 1909, 5 cwt. basic slag and 2 cwt. kainit, 1912, 1915–16, 1919–20, 1922–23	20·9
2b	5 cwt. basic slag and 2 cwt. kainit as Plot 2a, and, in addition, 1 cwt. nitrate of soda in 1909, 1912, 1916, 1920, 1923	22·6
3	7 cwt. superphosphate, 1901, 1904, 1907, 1912, 1915–16, 1919–20, 1922–23	20·1
4	Unmanured	10·8
5	7 cwt. superphosphate and 3½ cwt. kainit, 1901, 1904, 1907, 1912, 1915–16, 1919–20, 1922–23	22·7
6	7 cwt. superphosphate and 10 cwt. lime, 1901, 1904, 1907, 1012, 1915–16, 1919–20, 1922–23	20·1
7	7 cwt. superphosphate and 71 lb. sulphate of ammonia, 1901, 1904, 1907, 1912, 1915–16, 1919–20, 1922–23	23·2
8	6 cwt. dissolved bones, 1901, 3½ cwt. bone meal, 1904, 1907, 1912, 1915–16, 1919–20, 1922–23	19·5

* All dates expressed as 1915–16, 1919–20, etc., mean that the manure was applied in the winter referred to.

Plot 8 receiving during this period several dressings of bone meal—containing, of course, phosphates insoluble in water together with some nitrogen—gave a yield very definitely inferior to those plots receiving phosphate in a more available form. In the later years of this period the yield of the bone-meal plot, relative to the others, gradually crept up—doubtless because the phosphates applied in earlier years were gradually becoming available.

Effect of Potash. Five dressings each of 2 cwt. of kainit, applied at intervals during 17 years as an addition to 4 dressings each of 10 cwt. basic slag gave an average increase of 1·2 cwt. of hay per annum. Dressings of $3\frac{1}{2}$ cwt. of kainit applied at intervals as an addition to superphosphate gave an average annual increase of 2·6 cwt. of hay per acre.

Effect of Nitrogen. Comparing plots 2a and 2b, the addition to basic slag and kainit of 1 cwt. nitrate of soda five times at intervals during the 17 years, resulted in an average increase of 1·7 cwt. of hay per acre per annum.

Comparing plots 3 and 7 the addition to superphosphate of 71 lb. sulphate of ammonia five times at intervals during the 17 years, resulted in an average increase of 3·1 cwt. of hay per acre per annum.

Effect of Lime. The addition of 10 cwt. of lime five times at intervals, to super, resulted in the same yield as super alone. As previously noted an increase by the use of lime was obtained in the first period in spite of the presence of a fair supply of lime in the soil. This was possibly because the lime encouraged any surface humus to decay. It would appear that nothing is to be gained by regular application of lime to grassland such as this, which already contains a sufficient supply.

Third Period, 1927–33.

During these years plots 2b and 7—which had previously received small dressings of nitrogenous manures at intervals, now received these dressings every year. This was done (at the suggestion of Mr. J. G. Stewart, M.A., of the Ministry of Agriculture) in order to give the nitrogen a better chance to influence the crop.

Effect of Phosphates. The returns from slag alone and superphosphate alone remained at more or less the same levels as in the previous period. The crops on these plots were definitely smaller than on several of the other plots which were receiving other plant foods in addition to phosphates. The larger dressing of slag on plot 1b continued to give a larger return that the smaller dressing on plot 2a. As previously

noted the relative yield from the bone meal plot tended to increase, probably because the accumulated reserves of phosphates, applied in previous years, became available.

Effect of Potash. The addition of 2 cwt. of kainit, at intervals, to 10 cwt. basic slag resulted in an increase of 5·1 cwt. of hay per acre per annum. A dressing of 3½ cwt. of kainit added to 7 cwt. of superphosphate at intervals increased the crop by 3·7 cwt. per acre per annum. Evidently the original reserves of potash in this heavy soil have become exhausted by the continued removal of hay. As previously noted the increases due to the addition of potash during the first and second periods were small, especially where slag was used.

TABLE III.

EFFECT OF MANURES ON HAY CROP AT SAXMUNDHAM, 3RD PERIOD, 1927–33.

Fiske's field (originally semi-derelict grass.)
Figures per acre.

Plot.	Treatment. Previous to the winter 1926–27 all plots were treated as indicated in Table II.	Average weight of hay for the 7 years 1927–33 inclusive.
		Cwt.
1a	10 cwt. basic slag, 1926–27 and 1930–31 . .	19·8
1b	10 cwt. basic slag and 2 cwt. kainit, 1926–27 and 1930–31	24·9
2a	5 cwt. basic slag and 2 cwt. kainit in 1926–27 and 1930–31	23·3
2b	5 cwt. basic slag and 2 cwt. kainit, 1926–27 and 1930–31, and 1 cwt. nitrate of soda, 1927 and every subsequent year	26·9
3	7 cwt. superphosphate, 1926–27 and 1930–31 .	22·1
4	Unmanured	12·1
5	7 cwt. superphosphate and 3½ cwt. kainit, 1926–27 and 1930–31	25·8
6	7 cwt. superphosphate and 10 cwt. lime, 1926–27 and 1930–31	21·8
7	7 cwt. superphosphate, 1926-27 and 1930–31, and 71 lb. sulphate of ammonia, 1927 and every subsequent year	28·4
8	3½ cwt. bone meal, 1926–27 and 1930–31 .	26·1

Effect of Nitrogen. The annual dressing of 1 cwt. of nitrate of soda applied to plot 2b, as an addition to basic slag and kainit, increased the average hay crop by 4 cwt. per acre. The annual dressing of 71 lb. of sulphate of ammonia as an addition to superphosphate increased the crop of plot 7 by 6·3 cwt. per acre as compared with plot 3 which received superphosphate alone.

Effect of Lime. The addition of 10 cwt. lime, at intervals, to superphosphate did not result in any increase of crop.

General Summary.

The original herbage of the field was of very poor quality. It consisted largely of self-sown plants on a neglected field. This herbage persisted, to a considerable extent and during the whole period, on the unmanured plot. Diminutive plants of wild white and wild red clover, the latter especially in certain years, have been quite conspicuous on the unmanured plot, although they have produced very little bulk. Knapweed and fleabane, especially the latter, have during recent years become unduly prevalent on all the plots. Small sedges are also abundant on the unmanured plot, but there are no rushes present. The first striking result of the manurial treatment was a great development of wild white and other clovers on the plots receiving phosphates. This resulted in comparatively high yields of hay being obtained during the first few years. Thus, in 1902, 48 cwt. of hay per acre and upwards was obtained on three plots (No. 1—10 cwt. basic slag; No. 7—superphosphate plus sulphate of ammonia; No. 8—dissolved bones).

In subsequent years heavy yields were obtained in certain seasons when there was sufficient, but not too much, moisture and warmth during May and June. A very wet year such as 1924 gave only an average crop and, although the land is both mole and pipe drained, apparently reduced the crop in the following year.

In unfavourable years—a cold March and April followed by hot dry weather in May and June—the crops have been very small on all plots and in three seasons not worth weighing. In 1911 no plot exceeded 9 cwt. of hay per acre.

The years in which there was no crop worth weighing have not been included in the average or that would have been lower. The well-manured plots have given hay of reasonably good quality, the proportion of clover varying from year to year. In the first years of the experiment phosphates alone gave remarkably good results, but later on the addition of potash produced quite definite increases in crop.

In the first period the superiority of a single dressing of 10 cwt. of basic slag over a similar quantity applied in two dressings was very evident.

The addition of nitrogen to phosphates, and to phosphates and potash, produced small but definite increases.

The large grasses likely to benefit by the addition of nitrogen were not present at the commencement of the experiment and never succeeded in establishing themselves.

The addition of lime to superphosphate, on a soil already containing a sufficient supply (except possibly in the surface layer), resulted in a small increase at first, but afterwards gave

no increase, or even a slight decrease of crop. On the whole it may be said that the various manurial dressings gave a very remarkable improvement in the first few years and that subsequent dressings of the same manures maintained this improvement at not quite such a high level. After the first few years however, the average crop obtained could not be regarded as good, even on the well-manured plots.

In 1926 plots of various grass mixtures, which are reported on later, were started in the same field. These mixtures included the larger grasses, wild white clover and lucerne. Comparison with these has made it increasingly evident that the old grass manurial plots started in 1901 on semi-derelict grass reported on above, have never reached, and are never likely to reach, the level of productivity attained by these plots of modern grass mixtures, suitably manured.

It has, therefore, been decided to plough them up.

From observations here and elsewhere it is difficult to resist the conclusion that there are considerable areas of grassland in this country which were never properly sown down and which, in spite of manuring with slag and other materials, are never likely to reach a very high standard of productivity, because plants of high productivity are not present, and cannot be relied on to establish themselves even with a suitable system of manuring.

It seems probable that if such land were broken up, put through a course of tillage and then re-seeded with a suitable mixture of herbage plants, its productivity would be vastly increased. The saving of wild white clover seed, and its comparative cheapness, have entirely altered the situation regarding breaking up and laying down grassland. Because of the ease with which a pasture can be made, it seems prudent to undertake the breaking up of an inferior pasture with very much less consideration than was necessary in the days when it was said that " to make a pasture broke a man ".

Effect of different forms of phosphate.

In 1920 plots were laid out on another portion of the old grass (semi-derelict in 1900) and the same series of plots on new grass (sown in 1903), both in Fiske's Field, to test different types of phosphates.

In these tests high-soluble slags gave results strikingly superior to those obtained from low-soluble slag and North African phosphate. There was no difference in the results obtained from a slag containing a high percentage of phosphates, with high solubility, and a correspondingly heavier dressing (to supply the same quantity of phosphate) of an open hearth slag with a low percentage of phosphates, also of high solubility.

The results obtained from the relatively insoluble phosphates

in the low-soluble slag and the North African phosphate improved in the later years of the experiment—doubtless as the initial dressing gradually became available. Superphosphate gave excellent results, but since it was not used in the first period of the experiment, the results are not exactly comparable.

It is evident that on the chalky boulder clay at Saxmundham, with a comparatively dry climate, phosphates having a high degree of solubility give a much better return than those of low solubility.

Effect of Manures on newly seeded down grass.

Adjoining the manurial plots on semi-derelict grassland, above referred to, 8 plots, each ¼ acre in extent, were sown with various mixtures of grass seed in 1903. These plots were cross-dressed with manures and the produce of all the sub-plots was weighed every year between 1904 and 1928 except in 1907, 1908 and 1917.

The effect of the manures was as follows :—

TABLE V.

Plot.	Treatment.	Average yield of all mixtures in cwt. of hay per acre.	
		Years 1904–15 inclusive.	Years 1916–20 inclusive.
A	No manure	13·1	12·9
B	½ ton basic slag, 1902–03, 1907–08, 1912–13, 1915–16, 1919–20, 1922–23, 1926–27 (*i.e.*, 7 dressings in 23 years)	23·8	19·9
C	½ ton rape dust do.	16·9	17·2
D	10 tons farmyard manure do.	20·8	21·2

None of the grass mixtures contained wild white clover seed, yet in spite of this, repeated dressings of basic slag have given heavier crops of hay than either rape dust or farmyard manure. The hay produced by the basic slag has also been greatly superior in quality to that given by the other two manures, and it has contained much more leguminous herbage.

SECTION B.

Fiske's Field Grass Mixtures—(*Started* 1903). In 1903, at the suggestion of the late Sir William Somerville, 8 mixtures of grass seeds were sown, the experiment being a duplicate of one at Abbotsley in Huntingdonshire. At this time, to quote Professor Middleton, " Experiments upon laying land down to grass were very much wanted " (Ref. 5). The plots were cross-

dressed, as previously mentioned, with basic slag, rape cake, and farmyard manure, a portion being left untreated. The results of the manurial trials have already been given. At this time wild white clover seed was not commonly used, and it was not included in any of the mixtures. Of these mixtures some were very simple—ryegrass and clover—others complicated and expensive, containing many of the "natural" grasses. The cost of the seeds varied between 14*s.* 6*d.* and 46*s.* per acre.

Details of the mixtures were given by Professor Middleton (Ref. 1) and by the writer (Ref. 2).

The crops on these plots were regularly weighed between 1904 and 1928; three seasons were missed, so that the figures for 23 years are available.

As previously mentioned, basic slag was used as a cross dressing on these plots, 7 dressings being applied in 23 years. There was very little difference in the average yields of the various mixtures of seeds on the portions manured with slag, with one exception; thus we find that, on an average over the whole period, the lowest yield of hay on the 7 plots was 20·1 cwt. and the highest 22·1. The exception was a plot sown with one of Elliot's mixtures, which gave over the whole period an average of 2·8 cwt. more hay than any of the others.

On the unmanured plot the superiority of Elliot's mixture was much more definite. Thus in the first 8 years the unmanured section of Elliot's mixture gave an average yield of 23·4 cwt. of hay, the highest yield on the unmanured portion of any of the other plots being 16·7 cwt. At the time these plots were started much interest was taken in the system of farming adopted by the late Mr. R. H. Elliot on his estate at Clifton, Roxburghshire, on high-lying stony soil.

This system has been described elsewhere (Ref. 3 and 4). Briefly it consists of sowing temporary leys containing deep-rooting, drought-resisting plants with the object of increasing productivity and accumulating humus and fertility for subsequent arable crops. The deep-rooting plants advocated were kidney vetch, burnet, chicory, sheep's parsley, and yarrow. At Abbotsley, on poor Oxford clay, Elliot's mixture also proved the most satisfactory. Thus Professor Middleton (Ref. 5) in placing the Abbotsley plots in order of merit says "No. 8 (Mr. R. H. Elliot's 1895 mixture) was first, the others nowhere".

It would appear, therefore, that Elliot's contention (that is it desirable to include deep-rooting plants in a temporary ley) is sound, and is borne out by experience not only on his own farm under dry conditions, in the Cheviots but also on stiff heavy soils in the Eastern Counties with a low rainfall.

Elliot (Ref. 3) referred to lucerne and to its great value as a deep rooter and drought resister in the Eastern and Southern Counties of England, but mentioned that it seemed unsuited to the soil and climate of Roxburghshire. Sir John Lawes recommended its inclusion in mixtures for permanent grass.

The successful inoculation of lucerne, which has been perfected by Dr. Thornton of Rothamsted, has undoubtedly extended the area over which lucerne can be grown. The value of lucerne as an ingredient in grass mixtures is referred to later.

Section C.

Grass Mixtures, Fiske's Field, started 1926. In 1926, 14 grass mixture plots, in duplicate, were put down in the same field as the other grass experiments, on land which, semi-derelict in 1900, was broken up during the war and put through a course of tillage.

Before sowing the seed the whole area received a dressing of 3 cwt. basic slag and 2 cwt. superphosphate per acre. In every year subsequent to 1928 a uniform dressing of 2 cwt. superphosphate and 1 cwt. sulphate of ammonia per acre has been applied.

The first crop was mown each year and in 1927 and 1929 the second crop also was mown. In other years the second crop was grazed, and every year the whole area was uniformly grazed during autumn and winter. We thus have the average yields of hay for 7 years.

Red Clovers. A standard mixture recommended by Professor Stapledon was sown, with various types of red clovers, on a number of plots. The difference in yield on the plots sown with these various clovers over a period of 7 years was not great. Montgomery red clover, with an average annual yield of 51 cwt. of hay per acre, was slightly the best, but the lowest of the series yielded 45 cwt. of hay annually. The late-flowering red clovers had practically disappeared after the third year.

Lucerne. Mixtures containing lucerne gave the heaviest average total yield of the whole series of plots for 7 years 52 cwt. of hay per acre (where lucerne was substituted for cocksfoot) and 53 cwt. (where both lucerne and cocksfoot were included in the mixture).

After sowing, in 1926, the weather was fairly dry and favourable to lucerne, so that it established itself and, in spite of several wet periods since, there was a little left in 1933. The autumn and winter grazing does not appear to have injured it.

The areas containing lucerne have always looked greener in early summer than the others, and in the drought of 1929 were the only plots to yield any appreciable aftermath.

It seems probable that the inclusion of a few pounds of lucerne seed per acre in grass mixtures, in all districts where it is likely to succeed, is sound practice. Where lucerne has not been grown before, the seed should be inoculated. If the lucerne persists it will add to the crop, especially in dry years. When it dies out, the deep roots, on decaying, act as natural drainage channels, and increase the fertility of the soil in the same way as Elliot's deep-rooting plants. Where lucerne thrives, there can be little doubt that it is superior in most respects to three of the deep-rooting plants recommended by Elliot—burnet, chicory and yarrow.

Ryegrass Mixtures. Plots were sown with :—

	Lb. per acre.
Perennial ryegrass	24
English late-flowering red clover	6
Wild white clover	2

Two plots included commercial, and two indigenous perennial ryegrass.

The indigenous perennial did not come up, after sowing, nearly so thickly as the ordinary perennial. The crops at first were identical in weight, the total yield of two cuts for the first year being 109 cwt. of hay per acre in both cases, and the heaviest in the entire series of plots. Over the whole period of 7 years the commercial perennial ryegrass plot gave an average yield of 48 cwt. per acre of hay, and the indigenous 45 cwt. We had no means of testing the feeding value of the hay.

These plots were very thick at the bottom and made good grazing throughout the entire period. When heavy rain fell before cutting they became very badly laid and were difficult to cut. Evidently mixtures for cutting should contain a proportion of the tall and erect grasses, but where it is intended to mow the first year only, afterwards grazing for a few years, and then breaking up, this simple and inexpensive mixture containing perennial ryegrass and red and wild white clovers seems quite suitable for heavy land.

Dutch white and wild white clovers contrasted. (1 lb. of each sown per acre—grass mixtures identical in other respects.) In this and in another series of experiments in the same field, the Dutch white clover gave the heaviest crop in the first two years of the experiment. After this the Dutch plot became strikingly inferior in productivity and in the character of its turf. Practically all the Dutch white died out, leaving an extremely poor sole, whereas the wild white clover plot was a carpet of

green. The striking inferiority of the Dutch white plot persisted at the end of the period of seven years.

The average annual yield of hay on the Dutch white plot was 38 cwt. per acre over the 7 years, and of the wild white plot, 45 cwt. Evidently it is worth while to sow wild white clover where it is intended to let the mixture lie down for more than two years, but not if it is intended to break up after the second year.

In this series of plots (sown 1926) in spite of the smothering effect of heavy hay crops, wild white clover has succeeded, wherever it has been sown, in forming a carpet over the whole ground. This has proved especially true where the grass crop has been cut before the middle of June.

"Saxmundham" Mixture for temporary or permanent mowing grass. As a result of observations made on these plots the following, known as "Saxmundham" Mixture, suited for heavy but well-drained land containing sufficient lime, and situated in a fairly dry district, has been evolved :--

	Lb. per acre.
Perennial rye grass	10
Timothy	4
English (or Montgomery) late-flowering red clover	6
Lucerne (inoculated if the land has not grown lucerne before)	8
Wild white clover	1

Timothy appears to be a very valuable grass on Suffolk heavy land. It is very erect, gives a heavy yield of hay and helps the crop to stand up. Cocksfoot grows a heavy crop, but is apt to get coarse on this heavy land unless sown thickly and very carefully grazed. It may be included in the above mixture if desired.

The various treatments contrasted. We had in the same field—

(*a*) Grass land, semi-derelict in 1900, which underwent a course of manuring over a period of 30 years.

This treatment resulted in a very striking improvement during the first few years. After the first seven years, however, it was found that no manure or combination of manures raised the yield of hay to an average of 30 cwt. per acre. In three dry seasons the crop was so small as not to be worth weighing. Had these been included in the figures, the averages would have been lower. During the last 7 years, 1927–33, the best average yield was 28·4 cwt.

(*b*) Similar land broken up and sown in 1903 with grass mixtures.

This gave good yields in the first year, but afterwards the crops remained at a rather low level of productivity, one

mixture—Elliot's, containing deep rooting plants, being superior to the others.

None of these latter plots, however, gave a very good average yield. For the first ten years the average of the whole, when manured with basic slag, was only 23·8 cwt., and for a second 13 years, when manured in the same way, the average was 20 cwt.

(*c*) Similar land broken up during the war, put through a course of tillage and sown down in 1926, with modern mixtures, including only three or four large grasses, various red clovers (lucerne on two plots only) and an average of 1 lb. of wild white clover per acre.

This gave an average yield of hay for the 7 years, 1927–33, of 47 cwt. per acre per annum. Neither the manurial treatment nor the previous cropping of this land was exactly the same as in the previous cases, nevertheless it is difficult to resist the conclusion that some at least of the remarkable superiority in productivity of these plots is due to the superior grass mixtures sown. Moreover the turf on the 1926 plots is much superior to that on the other plots—there is a useful sole of wild white clover, in spite of the fact that the heavy crop of hay removed annually must have considerably checked and shaded that plant. That this was the case is indicated by the fact previously referred to, that early cutting of the hay crop has resulted in a much greater development of wild white clover. It seems probable that the superiority of these mixtures is due to the sowing of large bulky grasses, with late flowering red and wild white clovers.

The fact that no system of manuring has succeeded in raising the old "semi-derelict" grass to a high level of productivity is no doubt due to the fact that the large grasses are not present, having never been sown and not having succeeded in establishing themselves naturally.

General Conclusions. The policy of allowing arable land to "tumble down" to grass, even if followed by suitable manuring, evidently results in inferior productivity over a period of at least thirty years.

With the present comparative cheapness of simple grass mixtures, and the extreme cheapness of wild white clover seed, such a policy stands doubly condemned. It merely results in making an addition to what Sir Thomas Middleton has so aptly termed "the wasted land of England."

The so-called pastures, which were allowed to tumble down to grass in the nineties of last century are deserving of consideration. Inferior as they are, in most cases they will have accumulated a certain amount of fertility so that if broken up

and skilfully cropped for a few years reasonably good crops might be expected, which might very likely at least pay expenses.

The figures given in Tables I, II and III, as well as experience elsewhere, indicate that the initial striking result which often follows the application of phosphatic manures to semi-derelict heavy-land pasture containing small plants of wild white and red clovers is frequently not maintained in later years even although the manuring is continued. A sound policy in dealing with such inferior pasture would seem to be to apply a dressing of phosphates, in order to get the initial response, then, after a lapse of 3 years or so, to break it up, put the land through a course of tillage and re-seed with a modern mixture. By this means it seems probable that the productivity of the land might be almost, if not quite, doubled.

A further case of importance is where we have bad, coarse pastures on good land. These have very often never been under the plough in the memory of man. There is a great accumulation of vegetable matter and fertility—yet the herbage is coarse, and unpalatable to stock. In many cases it does not respond at all well to manures. Such land, if broken up and planted for a few years with suitable crops, might prove very profitable to the occupier. If then it were seeded down to a modern mixture, its palatability and suitability for stock would probably be greatly increased. It is also worthy of note that on newly-laid-down pastures stock undoubtedly thrive better, probably partly because the land is less infested with internal parasites of animals.

Summary.

We are able, from the experiments on heavy land at Saxmundham, under rather dry climatic conditions, to form the following conclusions :—

1. Grass which was semi-derelict in 1900 responded remarkably well to phosphates and nitrogen, especially for the first few years, but even with suitable manures over a period of 30 years the yield of hay was not raised to a very high level.

2. Highly soluble phosphates, in slag and superphosphates, proved more effective than low-soluble phosphates in slag or North African phosphates.

3. Grass mixtures put down in 1903 indicated that over a period of 23 years Elliot's mixture, containing deep-rooting plants, gave a larger crop than the others tried. It seems probable that the deep-rooting plants, chicory, burnet, kidney vetch, and yarrow are desirable ingredients of grazing mixtures under dry and poor conditions.

4. There is reason to believe that lucerne, being a very valuable deep-rooting plant, is a desirable ingredient in temporary or permanent grass mixture wherever it will grow, and is of greater value than chicory (which is a bad hay plant) or burnet.

5. Grass mixtures sown in 1926 show that modern mixtures containing three or four large grasses, late-flowering red clover, and 1 lb. of wild white clover per acre, give much greater crops of hay and a superior grazing pasture to the type of grass mixture sown in 1903.

6. The superiority in productivity of land sown with modern grass mixtures over similar land which was allowed to "tumble down" to grass years ago, is so great that there is good reason to believe that it might in many cases be desirable to break up the inferior grass, put the land, possibly after an initial manuring, through a course of cropping and re-seed with a modern wild-white-clover mixture.

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BASIC SLAGS AND MINERAL PHOSPHATES.

The production and use of basic slags and mineral phosphates were the subject of active discussion in the early post-war years, for changes in steel manufacture before and during the war gave new types of basic slag, and led to a re-examination of the possibility of using mineral phosphates directly. The position was well reviewed in 1920 at a Conference of the Faraday Society (Ref. 1) on "Basic Slags: Their Production and Use in Agriculture", and in 1922 by G. Scott Robertson in his monograph on "Basic Slags and Rock Phosphates". In the present Paper it is proposed to review some of the subsequent work both in this country and abroad. No attempt will be made to demonstrate the importance of basic slag, for it is the recognised basis for building up and maintaining the fertility of great areas of this country. At one time it was associated especially with the improvement of poor clay pastures, but it is now realised that it may be used with advantage on any type of soil deficient in phosphate, whether grassland or arable. The range of usefulness of mineral phosphate is much more limited, as is shown sufficiently by the circumstance that only 2 per cent. of the world's output is used directly on the land. The agricultural problems involved are difficult, for it is now realised that slagging may be ineffective on pastures unless the grazing is properly adjusted to deal efficiently with the increased growth and the change in the type of herbage. The chemical problems are much more obscure than with the other common fertilisers, which latter are all simple salts or their mixtures, especially manufactured or purified to contain known amounts of specified elements in easily recognised compounds. Basic slags and mineral phosphates are merely ground as they come from the steel works or the mine, and they vary in composition according to their origin. The content of total phosphoric acid is not a sufficient guide to their value, though it is the only one, apart from fineness, at present specified by the Regulations of the Fertilisers and Feeding Stuffs Act. Improved standardisation can come only through further study of the chemistry of the materials and through reliable comparative fertiliser trials under varied conditions.

As the result of a recommendation made at the Faraday Society Conference, the Minister of Agriculture set up a Permanent Committee on Basic Slag, under the Chairmanship of Sir John Russell, with instructions "to consider the development and improvement of the manufacture of basic slag and the extension of its use". The Committee found little prospect of serious modification of the manufacturing processes, and devoted most of its work to the extension of the use of basic

slag, by making a detailed study of the agricultural values of the slags available to the farmer and of the chemical means by which their values might be expressed. The Committee has issued twelve Interim Reports of which the last seven had appendices, by the present writer and Mr. R. G. Warren, on the results of field, pot culture and laboratory work conducted by the Rothamsted staff in conjunction with a number of local workers at centres throughout England. Some of these results will be briefly summarised later in this Paper. From 1921 to 1924 the Agricultural Education Association conducted a somewhat inconclusive series of comparative field experiments on hay land.

In Germany basic slag (from the Bessemer but not the Open Hearth process) is used more generally than in this country and, during the war and again during the recent wave of economic nationalism, it acquired special importance as the only internal source of phosphatic fertiliser. The slag producers set up their own Experimental Station and since 1930 have published a technical journal—*Die Phosphorsäure* (Phosphoric Acid)—containing papers on the scientific and practical problems connected with the utilisation of phosphates in agriculture. The most valuable recent German contribution to the study of basic slags has been on the purely chemical side. The Kaiser-Wilhelm Institute for Iron Research (Ref. 2) and the Central Laboratories of the Bavarian Cyanamide Works (Ref. 3) have investigated the various calcium phosphates by modern physical-chemical methods, including the equilibria at high temperatures and the analysis of crystal structure by means of X-rays. Some similar work has been undertaken in the United States Bureau of Chemistry and Soils (Ref. 4) in the course of a comprehensive study of the composition and properties of the American and other mineral phosphate deposits. In Russia D. N. Prianischnikow and his co-workers (Ref. 5) have made most interesting investigations on the plant physiological and chemical aspects of the utilisation of insoluble phosphates by plants.

The Manufacture of Steel and Basic Slag.

Since the composition and the supply of basic slag is determined by steel-works practice, a consideration of the different types of slag must be prefaced by some account of the processes by which they are made. Most British iron ores contain large amounts of phosphorus, and were unsuited for the original acid Bessemer process for making steel. In 1878, S. G. Thomas and P. C. Gilchrist showed how the phosphorus could be removed by using a basic lining and adding lime in the Bessemer convertor to produce a basic slag, which absorbed the oxides of

phosphorus, sulphur and silicon formed when the air blast was forced through the molten metal. In this process the phosphorus became a definite asset, for its combustion liberated a large fraction of the heat required. The basic slag—which in Germany is still known as "Thomasmehl" (Thomas meal)—had from 18 to 20 per cent. of phosphoric acid, present in a form which readily dissolved in dilute acids and which proved unexpectedly active as a phosphatic fertiliser. This was the material with which the early agricultural experience was obtained, and it still forms the bulk, if not almost the whole, of the slag in use on the Continent and in world trade. The basic Bessemer process was gradually displaced by a rival—the Open Hearth or Siemens-Martin process—in which the pig iron was heated with scrap or ore and quick lime or limestone by means of the combustion of producer gas and pre-heated air. In England the last Bessemer plant closed down shortly after the war, though a new one is now being built for the tube steel works at Corby, Northamptonshire. Since the Open Hearth process takes hours where the Bessemer process took minutes, the whole of the operations are under much more delicate control and the process yields more highly standardised steel. As in the older process the phosphorus and silica pass into the basic slag but a high phosphorus content in the pig iron is no longer necessary, and in most other countries the Open Hearth slags contain so little phosphoric acid that they do not appear to be used directly as fertilisers. In Germany the Open Hearth slags are used again in a modification of the basic Bessemer process and their phosphoric acid goes over into Bessemer basic slag. In this country the phosphoric acid content of the Open Hearth slag is always lower than that of Bessemer slag, and it fluctuates widely as market conditions affect the proportions of pig iron and scrap used in the charge. The change from Bessemer to Open Hearth slag would, however, have had little agricultural significance but for the circumstance that in certain works, producing special types of hard rail and other high-carbon steels, it is necessary to add fluorspar (calcium fluoride) towards the end of the process in order to keep the slag sufficiently mobile. Such fluorspar slags may have only a small fraction (down to 20 per cent.) of their phosphoric acid soluble in dilute acids, such as the conventional 2 per cent. solution of citric acid. During the last twenty years there has been much discussion on their agricultural value. The experimental results given in a later section leave no doubt that they are definitely less efficient as phosphatic fertilisers than either Bessemer slags or Open Hearth slags made without fluorspar. Until quite recently there was a well marked division between the fluorspar and the non-fluorspar slags. One-fifth to one-quarter of the total slag ground was "low-

soluble " (citric acid solubility below about 40 per cent.) and nearly all the remainder was "high-soluble" (citric acid solubility above 80 per cent.). During the last year or so, however, attempts to improve the fluorspar slags have led to the production of intermediate material, and it is likely that the proportion of a new class of "medium-soluble" slags will increase.

The Citric Acid Solubility of Basic Slags.

When basic slag was first used it was sometimes considered advisable to enrich the material in total phosphoric acid by adding mineral phosphate, but the slag phosphate proved to be so much more active as a fertiliser than the mineral phosphate, that such adjustment amounted to adulteration. Further, it was found in pot-culture tests that different samples of true basic slags varied widely in efficiency. The total phosphoric acid content was obviously an insufficient guide to fertiliser value, and, after trials with a number of other solutions, Paul Wagner, of Darmstadt, introduced in 1899 a method of determining the amount of phosphoric acid extracted when 5 gm. of slag were shaken for 30 minutes with 500 c.c. of 2 per cent. citric acid. This method was frankly empirical, but it was justified by the results of pot-culture experiments and was gradually adopted elsewhere. As recently as 1923 it was adopted by the Association of Official Agricultural Chemists in the United States. In almost all countries except Great Britain, basic slags are sold in terms of either the phosphoric acid soluble in citric acid or else in terms of the total phosphoric acid, with a guarantee that at least 80 per cent. is soluble in citric acid. Clearly the British low-soluble slags could not be sold under such regulations.

The citric acid test was included as an optional test in the Regulations of the Fertilisers and Feeding Stuffs Act of 1906, but it was ignored in the various war-time Fertiliser Prices Orders and omitted from the Regulations of the 1926 Act. It was reintroduced, again as an optional test, in the 1932 Regulations. The test was dropped during the war because it was desired to utilise all possible fertilisers and because the validity of the citric acid test had been challenged by G. S. Robertson and others. It was claimed that low-soluble slags gave much better results in the field than were suggested by their citric acid solubilities. Thus G. S. Robertson's hay experiments in Essex from 1915 to 1920 showed that a slag of 45 per cent. citric acid solubility produced quite as good results as high-soluble slags or mineral phosphate; a fluorspar slag with only 20 per cent.

solubility gave definite improvements in yields but was undoubtedly less effective than the other phosphatic fertilisers tested.

Later work has shown that the citric acid test serves to distinguish between two essentially different types of basic slags; those with more than 80 per cent. and those with less than 40 per cent. of their phosphoric acid soluble in the prescribed reagent. The limits are not, however, well defined and the method fails to discriminate properly between slags within each of these groups. There is a wide and indefinite region for medium-soluble slags which were of no practical importance until quite recently. During the last few years the vendors of basic slag have been prepared to give on demand a guarantee of more than 80 per cent. citric acid solubility and to sell the low-soluble slags at lower rates in districts with easy transport from the works.

It is possible that further work will lead to an improved method for characterising slags. Mr. R. G. Warren devised an extraction method which agreed more closely than the citric acid method with barley yields in pot cultures, but this method is too complex for commercial use.

The total phosphoric acid in basic slags varies from about 8 to 18 per cent. and must always be considered not merely in making purchases but in determining rates of dressing. A good deal of the disappointment with slag in some of the post-war years was due to neglect of this elementary point. Slags are grouped into "grades" according to their total phosphoric acid contents, and it is often assumed, quite erroneously, that "high-grade" slag is necessarily high-soluble slag. Slags with more than 18·5 per cent. phosphoric acid are probably imported Bessemer slags with high citric solubilities, but among home-produced Open Hearth slags it happens that more than four-fifths of the slags with less than 11 per cent. total P_2O_5 are of the high-soluble type but only three-fifths of the slag with 12 to 15 per cent. total P_2O_5 is high-soluble. Grinders tend to discard low-soluble slags with low total phosphoric acid, but to grind high-soluble slags of low total phosphoric acid content and low-soluble slags of high total phosphoric acid content. The term "grade" is so often used in a wrong sense of quality instead of quantity, that it would be better abandoned altogether.

Mineral Phosphates.

A recent bulletin (Ref. 4) from the United States Bureau of Chemistry and Soils contains a most valuable collection of analytical data on the composition of the main types of mineral

phosphates now mined. Since fluorine plays such an important part in determining the composition of British basic slags, it is interesting to find that the American workers have made particularly detailed studies on the fluorine contents of mineral phosphates. In the past the difficulty of making accurate fluorine analyses had prevented much systematic work in this direction, though the presence of fluorine was, of course, well known to superphosphate manufacturers. With regard to their fluorine the contents the mineral phosphates divide them into two clear groups—continental and island deposits. The North American and the North African (Gafsa, Morocco, Algeria and Egypt) phosphates contain from 25 to 31 per cent. of phosphoric acid, and about 3·5 to 4·0 per cent. of fluorine ; i.e. about 0·12 parts of fluorine per part of phosphoric acid. The mineral phosphates of the islands of the Pacific and Indian Ocean (e.g. Nauru, Ocean and Christmas Islands) contain more phosphoric acid (about 40 per cent.) and much less fluorine (about 2 to 3 per cent.) i.e. up to about 0·07 parts of fluorine per part of phosphoric acid. Fresh bones and recent deposits of Peruvian guano contain very small amounts of fluorine (only about one-twentieth as much as the Continental mineral phosphates), but fossil bones may contain about 3 per cent. of fluorine. The island phosphates are believed to have been formed from the leaching of soluble phosphates from bird guano into underlying deposits of limestone. They have doubtless derived their small amounts of fluorine from the waters to which they were exposed. The much older continental deposits are probably derived from fish and other marine animals and have acquired their much higher fluorine contents from contact with fluorine-bearing waters during long geological periods. They contain considerably more fluorine than the natural mineral (fluor-apatite), which has about 0·08 parts of fluorine per part of phosphoric acid.

Calcium Phosphates and the Apatites.

The chemistry of the natural and synthetic calcium phosphates remained obscure until it was possible by means of X-ray analysis to study directly the actual arrangements of the atoms within the solids. By the old convention of the Fertilisers and Feeding Stuffs Acts up to 1926, all phosphate analyses were recorded in terms of tricalcium phosphate, but this compound is probably rare both in nature and in the laboratory, and it certainly plays no important part in soil or fertiliser chemistry. It is extremely difficult to prepare and it is decomposed by water. Contrary to the teachings of the elementary text books,

it is readily soluble in citric acid. Probably all natural calcium phosphates and all those prepared from solutions in the laboratory are more complex compounds related to the common mineral apatite. This occurs as long slender hexagonal needles in very many eruptive rocks (especially diorites and dolerites) and in crystalline schists, and as rounded grains in most of the sedimentary rocks. It is one of the most widely distributed of all accessory rock constituents and provides the primary source of almost all soil phosphoric acid. In many countries the general level of soil fertility depends on the amount of apatite present in the parent rocks from which the soils are derived. Thus in Australia, rocks containing apatite yield fertile soils relatively rich in organic matter, whereas those on rocks without much apatite have carried so sparce a vegetation that they yield infertile acid sands of very little agricultural value. From the conditions of its formation in molten magma and its almost universal distribution, it is clear that apatite represents a particularly stable and inert grouping of atoms. Almost all of the common phosphates of bones, guanos, mineral phosphates and some slags are closely related to this common apatite. The mineral apatite commonly contains about 3 per cent. of fluorine. Its chemical formula was formerly written as 3 $Ca_3P_2O_8.CaX_2$, but recent X-ray analyses have shown that the correct formula is $Ca_{10}(PO_4)_6X_2$. The X_2 in both formulae is most commonly fluorine (F_2) but it may also be chlorine (Cl_2), hydroxy- ($(OH)_2$), carbonate (CO_3), oxy- (O) or mixtures of these. The stable apatite framework allows the gradual replacement of one of these groups by another, but it may also take up a considerable excess of related compounds without causing serious disturbance in the fundamental structure or properties. In fresh bones the dominant compound is a carbonate apatite, or perhaps a hydroxyapatite containing some colloidal calcium carbonate. In fossil bones and island mineral phosphates the principal form is a fluor-hydroxy-apatite, and in the continental phosphates the fluorine content is so high that much of it must be present as excess calcium fluoride distributed throughout a fluorapatite skeleton. In the low-soluble Open Hearth slags (but not in non-fluorspar Open Hearth or Bessemer slags) the greater part of the phosphorus is present as fluorapatite.

Further, it has been shown that the calcium phosphate, which is stable in contact with water at the reactions of soils, is the hydroxyapatite, and the bulk of the phosphate added to soils in soluble fertilisers must pass over sooner or later into this form. The various apatites are thus of supreme importance in soil and fertiliser chemistry. They are slowly attacked by acids but the rate of action must depend on their physical state. Thus,

the hard mineral phosphates are less active than the soft ones, but both of them have individual crystals which are far too small to be visible under even the most powerful microscope. The apatite in rocks, soils and low-soluble slags is present in much larger crystals which are readily examined microscopically, and it is likely that these coarse grains will be attacked very slowly by dilute acids.

Before the phosphoric acid can become available to plants the apatite structure must be broken up. The simplest method is to remove the fluorine and form a water-soluble, acid calcium phosphate, i.e. to make superphosphate. Although this must slowly revert to an apatite in the soil, the product will be distributed over such a large area of the internal soil surface that it will remain available to plant roots for considerable periods.

It has been shown by Prianischnikow and his co-workers (Ref. 5) that plants differ very profoundly in their abilities to utilise the apatite compounds present in mineral phosphates. Thus, in decreasing order of ease of attack, the series is: lupins, buckwheat, mustard, peas, clovers, cereals. It would appear from the most recent work that lupin roots actually attack the mineral phosphate by generating some acid, for it has been shown that whereas oats alone cannot use mineral phosphate in sand cultures they are able to do so when grown with lupins, or when supplied with the drainage water from pots in which lupins were growing with mineral phosphate. In such experiments lupins appear to act as a superphosphate factory for the oats. Again, the acidity developed in the vicinity of the roots when plants take up ammonia from sulphate of ammonia serves to attack the apatite, and in soils the production of local acidity by plants and micro-organisms is doubtless responsible for a slow attack on apatites. The Russian work has shown, too, that the agricultural value of mineral phosphate falls off regularly from the acid podsol soils of the northern forest belt to the neutral or alkaline soils of the steppes. In Germany the use of mineral phosphates is restricted to acid peat soils ("Hochmoor"). Some of the conflicting experiences in the use of mineral phosphates in this country are probably to be explained by failure to note whether or not the soils were acid.

It has been observed repeatedly in this country and elsewhere that application of lime or limestone with mineral phosphate reduces the efficiency of the phosphate. It would appear now that some of the poor results from low-soluble slags are due not merely to the circumstance that most of the

phosphorus is present as fluorapatite, but to its being associated with basic calcium silicates which tend to neutralise the soil acids in the vicinity of the apatite crystals and protect them from attack. It has been found in the Rothamsted laboratory that many of the individual grains in low-soluble slag consist of crystals of fluorapatite with an out-growth of a calcium silicate.

In fluorspar slags the presence of fluorine provides conditions similar to those in the molten magma from which the crystalline basic igneous rocks were derived, and it is easy to understand why the dominant phosphate should be a fluorapatite. The conditions in the non-fluorspar slags are much more complex and only quite recently has there been any adequate study of the equilibria between lime and phosphoric acid under conditions approaching those of molten basic slags. As early as 1883 two types of crystal were isolated from slags: Hilgenstockite, a tetracalcium phosphate 4 CaO. P_2O_5, and Silicocarnotite, a calcium silicophosphate 5 CaO. P_2O_5. SiO_2. Other complex silicophosphates have been obtained (Ref. 6) but their compositions and properties are not yet well established.

In an excellent investigation G. Trömel (Ref. 2) has established the whole range of possible compounds which can be obtained from melts of lime and phosphoric acid. These include two forms of tricalcium phosphate, one of which is very readily and the other partially soluble in citric acid, and one tetracalcium phosphate, which is also readily soluble in citric acid. Much more important for basic slag work is the remarkable discovery that the citric acid solubility of the tetraphosphate falls off if it is cooled in air, and becomes very small indeed if, as it is cooled from its melting point at about 1,700°C, it is held for some time in air at about 1,100°C. The change is accompanied by an alteration in crystal structure from tetraphosphate to an apatite, and it was shown that this was brought about by moisture taken up from the air. It would be difficult to find a more convincing demonstration of the ease of formation and stability of an apatite than this production of a hydroxyapatite at a temperature far above that at which almost all other materials lose any water or hydrogen which they contain. It seems probable that in the early days of slag production, when slags were less siliceous and when they were often cooled by a jet of water, some of the tetraphosphate went over to a less soluble hydroxyapatite, yielding insoluble and inactive slags. It is possible that some modern slags also owe their insolubility to hydroxyapatites. Further, it may prove that even small proportions of fluorspar facilitate the formation of mixed fluor-hydroxy-apatites. Attempts to enrich slags by

adding mineral phosphate to the molten slag in the ladle have often reduced the citric acid solubility of the slag, and it now seems clear that under such conditions the excess fluorine of the mineral phosphate can convert soluble silicophosphates into fluor- and hydroxy- fluor-apatites, which are relatively insoluble. It is well known that non-fluorspar slags with high silicate contents have high citric solubilities, and many attempts have been made to increase the citric solubilities of Bessemer slags by blowing in sand; the extra silica should react with the tetra-phosphate and so reduce the chance of forming hydroxy-apatite on cooling. In Germany sand is added both in the Bessemer converter and in the slag-ladle, with the result that there is now no German basic slag with less than 93 per cent citric acid solubility.

The more complex equilibria between lime, phosphoric acid and silica have not yet been fully worked out, but it is known that silicocarnotite and some of the other silicophosphates are readily soluble in citric acid and readily available to plants.

The recent thermal and X-ray investigations on the calcium phosphates and silicophosphates should give a new stimulus to attempts to improve basic slags.

Pot Culture Experiments on Basic Slags and Other Phosphates.

Since it is impossible to carry out accurate field trials on a large number of phosphatic fertilisers at the same time, preliminary trials must be made in pot cultures, and a few typical slags must then be selected for further trial in the field. The pot culture technique obviously cannot reproduce all the conditions of the field trials, and the results are not directly applicable in practice, but it is reasonably safe to conclude that if two slags differ widely in the amounts of phosphoric acid available to plants in pot cultures they are also likely to show differences in the same direction under most field conditions. Although it is true that yields may be influenced by the rate at which the phosphoric acid is supplied, and may also be limited by seasonal or other environmental conditions which prevent the plants from producing dry matter proportional to the amounts of phosphoric acid absorbed, yet the actual uptake or percentage recovery of the added phosphoric acid provides a useful measure of the availability of the phosphoric acid supplied by the fertiliser. Further, it provides a convenient basis for comparing the results of experiments conducted under widely varying conditions.

TABLE 1.

PERCENTAGE RECOVERY OF PHOSPHORIC ACID IN BARLEY GRAIN AND STRAW IN ROTHAMSTED POT CULTURE EXPERIMENTS.

Season.	Fertiliser / Citric acid solubility / Soil.	Low-soluble slags below 40%.	Gafsa mineral phosphate. —	Medium-soluble slags. 40% to 80%.	High-soluble slags. over 80%.	Super-phosphate —
1. 1929.	Quartz sand + calcium carbonate ..	5, 13	—	28	24, 30	51
2. 1927, 8, 9.	Calcareous soil from Oolite, Gloucestershire	7, 12, 20	18	27, 29	28, 33, 38, 39	39
3. 1927, 8, 9.	Acid soil from Millstone Grit, Cheshire	14, 19, 22	19	20, 28	30, 31, 31, 34	22
4. 1929, 30, 31.	Acid soil from Millstone Grit, Cheshire	9, 14, 16, 17, 18, 20, 21	18	—	34, 35, 37, 38	31

Table 1 gives the results of four recent series of pot experiments on barley at Rothamsted on typical low-, medium- and high-soluble slags. For brevity the results are expressed as percentage recoveries of phosphoric acid, which are obtained from the excess of phosphoric acid in the total produce with fertiliser over that with no added phosphatic fertiliser, expressed as a percentage of the amount of total phosphoric acid added. Two of the experiments were in calcareous soil or sand and two on acid soils. Three of the experiments were continued for three seasons, the phosphatic fertilisers being added only once at the beginning of the experiment. About one-third of the phosphoric acid added in high-soluble slags or in superphosphate was recovered in the crops. The different high-soluble slags gave similar results. In the acid soils superphosphate gave as good recoveries as the high-soluble slags in the first year, but it fell behind them in the second and third years, presumably through the formation of insoluble iron and aluminium phosphates. It must be remembered that in pot cultures the fertilisers are distributed much more uniformly and intimately throughout the soil than is possible under field conditions, and it is therefore unlikely that in the field the recoveries would be so high, or that superphosphate would lose its availability so rapidly. In general, the few medium-soluble slags tested gave recoveries only a little below those of the high-soluble slags. The low-soluble slags gave definitely lower recoveries than the more soluble slags and about the same recovery as mineral phosphate. In the acid soils the results are complicated by the effects of the lime in the slags, for it was found that calcium carbonate, in amounts roughly equal to those of the slags, increased the yields and the phosphoric acid contents of the crops by about the same amount as the low-

soluble slags. The pot experiments on acid soils probably overestimate the actual availabilities of the slag phosphates. Although the citric acid solubility sufficed to divide the slags reasonably well into three groups, there were some exceptions and further, the order of the slags within each group did not follow their citric acid solubilities. The citric acid test is essentially qualitative. It distinguishes clearly between very high-soluble and very low-soluble slags, but it leaves considerable uncertainty about the limits defining these groups. Until recently this uncertainty was of no great importance since only a very small fraction of the slags produced had citric acid solubilities between 40 and 80 per cent. The preliminary results of a new series of experiments on ryegrass in pots in 1934 show that for several medium-soluble slags the yields follow the citric acid solubilities reasonably well.

Hay Experiments.

Since the bulk of the slag used in this country goes on to grassland, most of the recent comparative field trials on basic slag have been on the hay crop. Hay trials cannot show what would happen under pasture conditions, but, provided that the hay yields are supplemented by analyses of the produce for phosphoric acid, they are able to give useful comparative data on the relative availabilities of different sources of phosphoric acid. If the uptake and recovery of phosphoric acid is low in a trial on hay, it is highly probable that it would also be low under grazing conditions.

The results of some recent hay trials, conducted on behalf of the Basic Slag Committee, will be briefly considered.

Table 2.

MEAN YIELDS AND PHOSPHORIC ACID RECOVERIES IN HAY TRIALS, 1926 TO 1929.

(Fertilisers supplied 100 lb. P_2O_5 per acre in 1926 and four hay crops were taken.)

	% Citric Acid Solubility of slag.	Mean yield of hay cwt. per acre.		Mean percentage P_2O_5 in dry hay.		Percentage recovery in hay of added P_2O_5.	
		Brooke.	Enmore.	Brooke.	Enmore.	Brooke.	Enmore.
No phosphate		22·6	20·7	0·29	0·31	—	—
Slag L . .	37	25·5	23·3	0·31	0·36	5·3	8·1
Slag M . .	61	27·9	25·4	0·34	0·38	11·2	18·9
Slag H . .	87	31·0	24·2	0·34	0·39	15·1	14·4
Standard error		0·86	1·13	—	—	—	—

Table 2 gives the mean yields over four seasons of two experiments, one on a calcareous soil in Norfolk and the other on an acid soil in Devon, comparing three basic slags selected as typical of the low-, medium- and high-soluble slags produced in 1926. It will be noted that the low-soluble slag used had a citric acid solubility approaching the conventional boundary line between low and medium solubilities. The slags were applied at the rate of 100 lb. of phosphoric acid per acre in the late spring of 1926. At Brooke (Norfolk) only the high-soluble

slag produced any effect in the first year; subsequently the yields were roughly in the order of citric acid solubilities. At Enmore (Devon) the response to the phosphates was much less than at Brooke, and it was not possible to establish significant differences in the yields from the various slags. In each experiment the slags increased the phosphoric acid content of the hay, and the percentage recovery of the added phosphoric acid came out in the order of the citric acid solubilities. The differences, especially between high- and medium-soluble slags, were much less on the acid than on the calcareous soil. In other words, the low- and medium-soluble slags proved more available on the acid than on the neutral soil, whilst the high-soluble slag gave similar recoveries on both soils.

In 1930 and 1931 a new series of experiments on hay, and also on repeatedly mown young grass, was commenced at a number of centres throughout England to test typical high- and low-soluble slags against superphosphate and mineral phosphate, all supplying the same amount of total phosphoric acid (1 cwt. P_2O_5 per acre). The low-soluble slag had only 23 per cent. citric solubility whilst the high-soluble slag had 96 per cent.

TABLE 3.

YIELDS AND COMPOSITION OF HAY IN NORTHALLERTON EXPERIMENT IN EACH OF THREE YEARS 1931–1933.

(Fertilisers supplied 1 cwt of P_2O_5 per acre in 1931.)

	Without Phosphate. O	Low soluble slag. L	Gafsa mineral phosphate. M	High-soluble slag H	Superphosphate S	Standard error. —	Significant Differences [1] —
Yield of dry hay in cwt. per acre.							
1931 . .	24·3	29·5	33·6	36·4	37·8	0·79	S, H>M>L>O
1932 . .	12·8	15·2	18·6	19·3	18·7	0·43	S, H, M>L>O
1933 . .	14·6	18·2	21·0	21·3	19·9	0 44	S, H, M>L>O; H>S
Nitrogen as per cent. of dry hay.							
1931 . .	1·32	1·36	1·55	1·58	1·59	0 032	S, H, M>LO
1932 . .	1·56	1·68	1·82	1·81	1·89	0·063	S, H, M>O; S>L
1933 . .	1·28	1·40	1·51	1·45	1·49	0 028	S, H, M>O; S, M>L
Phosphoric acid as per cent. of dry hay.							
1931 . .	0·28	0·33	0·48	0·51	0·56	0 009	S>H>M>L>O
1932 . .	0·30	0·34	0·43	0·43	0·45	0·012	S, H, M>L, O
1933 . .	0·24	0·26	0·32	0·32	0·33	0·007	S, H, M>L, O
Calcium oxide as per cent. of dry hay.							
1931 . .	1·01	1·16	1·32	1·37	1·38	—	
1932 . .	1 06	1·23	1·45	1·29	1·41	—	
1933 . .	1 20	1·28	1·32	1·24	1·32	—	
Total yields for three years (relative to unmanured).							
Dry hay . .	100	122	141	149	148	—	
Protein in herbage . .	100	127	158	163	168	—	
Calcium oxide in herbage .	100	137	178	182	188	—	
Phosphoric acid in herbage .	100	187	211	226	245	—	
Percentage recovery of phosphoric acid added.							
1931 . .	—	3·0	9·1	11·1	13·5	—	
1931, 2 . .	—	4·2	12·9	15·0	17·9	—	
1931, 2, 3 .	—	5·4	16·0	18·2	20·9	—	

[1] S=Superphosphate; H=High-soluble slag; M=Mineral phosphate; L=Low-soluble slag, O=Without phosphate. The first group of letters mean that superphosphate and high-soluble slag were significantly better than mineral phosphate; mineral phosphate than low-soluble slag, and low-soluble slag than no phosphate

The results for three seasons on an acid soil near Northallerton, Yorkshire, are presented in Table 3 in some detail, for differential effects both on yield and on composition of hay were shown particularly clearly. As the produce from each of the 25 plots of a Latin Square experiment was analysed each year for nitrogen and phosphoric acid, it is possible to estimate the statistical significance of both the yield and the analytical data. The significant differences between treatments are shown in the last column of Table 3.

Although the fertilisers were not applied until 19th March, 1931, yields of hay cut on 27th August, 1931, showed striking responses and marked differences between the fertilisers. Superphosphate and high-soluble slag gave significantly higher yields than mineral phosphate, which, in turn, gave significantly higher yields than low-soluble slag; but even the low-soluble slag gave a clear increase over the plots without added phosphate. In the phosphoric acid percentages of dry hay the fertilisers were arranged in order of solubility, each possible difference being statistically significant. Superphosphate, high-soluble slag and mineral phosphate gave markedly significant increases in the nitrogen and calcium contents of the hay, partly as the result of the increased proportion of clovers.

In the second and third seasons the hay yields were much below those of the first year, but there were still marked differences between treatments. Low-soluble slag increased the yield in each year but the three other fertilisers gave significantly higher yields; they also increased the nitrogen, phosphoric acid and lime contents of the hay above those of the unmanured hay, and sometimes above those for the low-soluble slag plots. High-soluble slag gave a higher yield than superphosphate in the third year but, apart from this, there was no significant difference between the effects of superphosphate, high-soluble slag and mineral phosphate in either the yield or the composition of the herbage after the first year.

Averaging the three seasons, the three more active fertilisers increased the yield of dry matter by about one-half and the total yield of protein by about two-thirds; they more than doubled the total phosphoric acid in the hay. Low-soluble slag had about one-half as large an effect on the dry matter and protein yields as the other three fertilisers and a much lower relative effect on the phosphoric acid in the hay. The recovery of phosphoric acid from low-soluble slag was from one-third to one-quarter of that from superphosphate, high-soluble slag or mineral phosphate, and there was no evidence that it was catching up the others as the experiment progressed.

The results of the experiment as a whole afford a good illustration of the improvement which may be effected in both

the quantity and the quality of the produce from phosphate-deficient soils, and there can be no doubt that similar, if not larger, relative effects would have been obtained under pasture conditions.

TABLE 4.

MEAN YIELDS AND PHOSPHORIC ACID RECOVERIES IN THREE-YEAR AND FOUR-YEAR HAY AND YOUNG GRASS EXPERIMENTS.

(Fertilizers supplied 1 cwt. of P_2O_5 per acre. Low-soluble slag had 23 per cent. citric solubility and high-soluble slag 96 per cent. citric solubility. Experiments 4, 7 and 8 are for three years, 1931 to 1933, and the others for four years, 1930 to 1933.)

Centre.	Geological Origin of Soil.	Soil Reaction[1] (pH value).	Mean Yield of dry matter in cwt. per acre on plots without phosphate.
HAY EXPERIMENTS.			
(*a*) *Neutral soils.*			
1. Braintree, Essex	Calcareous boulder clay	7·8	19·4
2. Badminton, Glos. . . .	Oolite	7·2	32·4
(*b*) *Acid soils.*			
3. Cockle Park, Northum. .	Boulder clay	4·9	6·2
4. Northallerton, Yorks. . .	Boulder clay on Keuper Marl	5 2	17·7
5. Chesterfield, Derby . .	Lower Coal Measures Shale	5·1	31 3
6. Lydbury, Salop . . .	Wenlock Shales	5·2	34·3
REPEATEDLY MOWN GRASS EXPERIMENTS.			
(*c*) *Neutral soils.*			
7. Much Hadham, Herts. (ungrazed—16 cuts) . .	Calcareous boulder clay	7·1	33·9
8. Much Hadham, Herts. (grazed, mown twice annually, 14 cuts from 5 sets of plots)	Calcareous boulder clay	7·1	29·0
(*d*) *Acid soils.*			
9. Dartington Hall, Devon (ungrazed, 33 cuts) . .	Devonian Shales	5·2	53·0

[1] A pH value of 7 implies neutrality, of over 7 alkalinity and of under 7 acidity.

	Mean yields of matter (without phosphate=100).					Percentage recovery in herbage of phosphoric acid added.			
	Without phosphate O	Low-soluble slag L	Gafsa mineral phosphate M	High-soluble slag H	Superphosphate S	Low-soluble slag L	Gafsa mineral phosphate M	High soluble slag H	Superphosphate S
HAY EXPERIMENTS.									
(*a*) *Neutral soils.*									
1. Braintree	100	109	105	132	128	3	3	17	17
2. Badminton	100	99	98	103	107	2	4	13	16
(*b*) *Acid soils.*									
3. Cockle Park . . .	100	134	104	171	181	3	10	7	8
4. Northallerton . . .	100	122	111	149	148	5	16	18	21
5. Chesterfield	100	109	114	113	120	6	13	13	15
6. Lydbury	100	102	105	103	101	10	10	14	18
YOUNG GRASS EXPERIMENTS.									
(*c*) *Neutral soils.*									
7. Much Hadham (ungrazed) .	100	103	104	116	112	8	8	34	30
8. Much Hadham (grazed) .	100	106	105	119	119	6	8	26	30
(*d*) *Acid soils.*									
9. Dartington	100	104	106	106	105	6	29	31	32
Means of all experiments				Neutral soils		5	6	22	23
				Acid soils		6	17	17	19

The results of five other hay experiments in the four seasons 1930 to 1933 are given, together with those of the Northallerton experiment, in Table 4. They show only the mean relative

yields and the percentage recoveries of the added phosphoric acid. Centres with neutral and acid soils are grouped together and, within each group, they are arranged in order of increasing mean yields on the unmanured plots. No yield response to phosphates was to be expected at the centres which averaged over 30 cwt. of dry hay per acre on the unmanured plots. The other centres gave results in the same direction as the North-allerton one just discussed, with the qualification that mineral phosphate failed to act on the calcareous soils. The comparisons are made most readily in terms of the percentage recovery of the added phosphoric acid. In all experiments superphosphate and high-soluble slag gave similar results, though superphosphate had the advantage in the first year and, at one centre (Braintree), high-soluble slag beat superphosphate in the three subsequent years. Mineral phosphate gave similar recoveries to superphosphate and high-soluble slag on each of the acid soils, but very low recoveries on the two neutral soils. Low-soluble slag gave low recoveries on all soils, and especially on the two neutral ones.

In an attempt to obtain conditions somewhat more akin to those of pastures two experiments, one on acid soil and the other on neutral soil, were made using repeated mowings of young grass to measure the effects of fertilisers. The Much Hadham experiment was in two parts ; one set of 25 plots was repeatedly mown without grazing, whilst five other similar sets of plots were subjected to uncontrolled grazing by Guernsey cows and sheep. One set of 25 grazed plots was fenced off for a three- or four-weeks' period each year and then mown to measure the effects of the fertilisers on growth of herbage ; the five sets were used in turn to give figures for five different periods throughout each season. The results of mowings on different plots, grazed throughout the year except for three or four weeks, are not, of course, strictly additive, but they serve to show the relative effects of the four phosphatic fertilisers. The results of the repeated mowing trials are generally similar to those of the hay trials, though the recovery of phosphoric acid was much higher, reaching 30 per cent. for high-soluble slag and superphosphate. Low-soluble slag proved ineffective at both centres, mineral phosphate was as effective as the two soluble fertilisers on the acid soil and as ineffective as low-soluble slag on the calcareous one, whilst there was no appreciable difference between high-soluble slag and superphosphate.

It may be noted that in hay experiments where the clovers and grasses were separated before analysis, both showed similar increases in phosphoric acid contents. At Braintree in the second year, when the proportions of clovers to grasses were much the same on all plots, high-soluble slag and super-

phosphate increased the phosphoric acid percentage of the dry matter by one-half in both clovers and grasses. In several of the experiments on hay and on young grass, the plots with the more active fertilisers gave slightly wetter produce, or in other words more leafy and juicy herbage, than the other plots. On one occasion in the Much Hadham experiment, when it was necessary after a spell of wet growing weather to cut the long grass by scythe instead of by a lawn mower, the workmen picked out all of the superphosphate and high-soluble slag plots as good ones and complained of the springy, wiry nature of the herbage of the others. It would appear that the vexed question of palatability in pasture improvement involves a similar discrimination by the stock.

Grazing Trials.

Since basic slag forms the basis for improving many types of poor pastures, grazing trials should form the most practical test of the relative values of the alternative phosphatic fertilisers. The well-known experiments at Cockle Park, in Northumberland, and at Shoby, in Leicestershire, have demonstrated the possibilities of slags for improving live-weight increases and cutting down cake bills, but such experiments have not yet proved suitable for comparative trials on similar materials. In some sheep-grazing trials conducted for the Basic Slag Committee for eight years at Rothamsted and for four years at Fiddington, in Somerset, and at Thrussington, in Leicestershire, the results were inconclusive. (Details are given in the Interim Reports of the Basic Slag Committee and summarised in Sir John Russell's Ministry of Agriculture Bulletin No. 28.) Several times it happened that some of the fertilisers improved the herbage to such an extent that the sheep were unable to cope with it, and the productivity of the land fell off. The problem involves all of those effects of grazing control discussed by Martin Jones (Ref. 8) in the last volume of this Journal.

Large plots would be required for mixed grazing experiments and the effects of lack of uniformity in the soil and among the animals would become large, unless a considerable number of plots could be used within one group of experiments, not necessarily in a single farm or district. The art of quantitative field experimentation on pasture has still to be developed. In the meantime much could be done by careful observation and counting of grazing days on a number of sets of similar fields treated with different phosphatic fertilisers.

The Non-Phosphatic Constituents of Basic Slag.

Basic slags contain from 40 to 50 per cent. of calcium oxide, 8 to 12 per cent. of iron, about 10 per cent. of silica, 2 to 5 per cent. of manganese, and many other elements in smaller amounts. Although basic slag is made from quicklime, only very small amounts of calcium oxide remain free. Most of the calcium is combined as silicophosphate (in high-soluble slag) or as apatite and dicalcium silicate (in low-soluble slag); the remainder is loosely combined with the oxides of iron and aluminium (Ref. 7). Most of the calcium compounds other than apatite decompose readily in the soil and the lime becomes available for plants or for neutralising soil acids. Since the lime is liberated, in the immediate vicinity of the phosphate, from the small crystals in the slag, it is possible that it has a more potent action than an equivalent amount of lime added separately. Thus, acid soils contain reactive iron and aluminium which may react with phosphates to form very insoluble compounds, but the lime liberated from the slag may reduce the acidity locally and retard this "reversion" of the phosphate. From some experiments in pot cultures on acid soil reported by the writer and Mr. Warren in an Appendix to the Eighth Interim Report of the Permanent Committee on Basic Slag, it was concluded that "as a tentative value and until more exact data are available there would seem to be no great error in regarding slags as roughly equivalent to calcium carbonate for liming purposes, even though their calcium contents are appreciably lower." Similar conclusions were reached by several other workers (Ref. 9) but subsequent work by A. Lauder and A. M. Smith (Ref. 10) in Edinburgh and by Miss Heintze at Rothamsted has shown that this conclusion over-estimated the value of the slag calcium for neutralising acid soils. High- and medium-soluble slags proved equivalent to about two-thirds of their weight of calcium carbonate, and low-soluble slag to about one-third of its weight. Low-soluble slags may, however, liberate more lime than the others in neutral or alkaline solutions, but the amount of this readily-soluble lime is small. The determination of precise equivalence between slags and limestone for neutralising acid soils is, however, difficult and of no great significance. The important thing is that the liming value is much higher than would be suggested by the methods for analysing limes and limestones, which are prescribed by the Fertilisers and Feeding Stuffs Regulations, but below that of an equal weight of limestone. Although periodic dressings of slag tend to offset the loss of lime, a few hundredweights of slag should not be expected to take the place of the heavy dressings of lime sometimes needed on very acid soils.

Silicates are known to facilitate the uptake of phosphoric acid by plants from soils deficient in available phosphate, and the silicates in basic slags may thus prove indirectly beneficial.

In some sandy soils relatively rich in organic matter and calcium carbonate, or recently limed, oats develop a characteristic " grey-stripe disease " which appears to be due to a deficiency of available manganese. It has been shown that basic slag, by supplying manganese, provides a convenient means of checking this disease. It may happen with increasing use of concentrated fertilisers, based on ammonium phosphate and in the form of relatively pure salts, that disturbances due to deficiencies of elements other than calcium, nitrogen, phosphorus and potassium will prove increasingly common, and as an insurance against the occurrence of such deficiencies occasional dressings of basic slag are to be recommended on both arable and grassland. A. W. Ling and W. R. Muir (Ref. 11) recorded some spectacular results with sugar beet on acid soils, in which basic slag gave yields far ahead of those from superphosphate used either with or without lime. Although no explanation has yet been found, it would appear to involve a deficiency of one of the less common but essential elements. The risk of such a deficiency occurring on a given soil is not high, but the premium for covering it costs nothing : use slag occasionally.

In the experiments undertaken on behalf of the Basic Slag Committee there was no evidence of any effects of basic slag other than those directly attributable to the phosphoric acid and the lime, acting largely through the encouragement of clovers which provided additional nitrogen. The availability of the phosphoric acid in slags is undoubtedly the primary factor in determining their value. It is probable that in the drier south and east of Great Britain, where the plants are frequently checked by water shortage, high solubility may be more important than in the moister north and west. In the experiments reported in this paper the relative values of the phosphate fertilisers appeared to depend much more on the reaction of the soil than on the climate, but the experiments here and elsewhere are too few for a clear decision. Many more experiments are wanted, and it is greatly to be hoped that those with facilities for field trials will take part in co-ordinated schemes of work in which every experiment increases the value of every other. Sometimes results opposed to those summarised here will be obtained. Thus, in a well-replicated experiment on hay, H. W. Gardner has recently found better results from mineral phosphate than from slag on a calcareous soil in Hertfordshire. Apparent contradictions in reliable experimental results may with further study point the way to important factors which have been overlooked, and little but harm is done when appar-

ently simple though highly uncertain experiments are made the basis for practical recommendations or for technical discussion.

The Permanent Committee on Basic Slag has arranged in 1934 a new series of experiments on swedes in Scotland and it is hoped to arrange further trials under grazing conditions. In the new experiments especial attention will be given to the medium-soluble slags. If they fulfil the promise of those few which have already been tested, and if they can be produced in place of the very low-soluble slags, then the British basic slag problem will be greatly simplified.

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THE RELATION BETWEEN DISEASE AND THE CONSTITUTION AND ENVIRONMENT OF THE TREE.

The study of pathology is a many sided one, and perhaps nothing is more characteristic of present day research than the increasing recognition that in the investigation of a diseased state, account must be taken of the whole life of the organism concerned. In this, Forest Pathology is no exception. The study of the diseases of trees has perhaps lagged behind any other branch of pathology. Human diseases are a very personal matter, and must needs be studied, if only for one's personal safety and comfort; animal diseases may be a danger to human kind, either as a source of infection or as endangering the food supply; the diseases of herbaceous plants involve our food supply and endanger our gardens; but the diseases of the forest trees only concern something of which there is still perhaps a superabundance, although at the present rate of the destruction of forests, it is not likely that there will long be such. Moreover, the big industrial areas are remote from the forest, their inhabitants as a rule know little of it, and the forest and its diseases remain as something rather distant and incomprehensible. Nevertheless, there have always been those who care for the forest and who have observed and attempted to determine the causes of the diseases that affect its trees. The history of Forest Pathology is one of knowledge increasing slowly and painfully; of conclusions reached on an imperfect basis of knowledge and of their gradual and slow revision as the true state of things comes to be realised. There is no one working in this subject, who is the least acquainted with its history, but realises that many of his conclusions are really of a temporary and incomplete nature and will in course of time be revised. It may, accordingly, be of interest to discuss some of the aspects of this subject which are of interest in this country at the present time.

Two things have affected the course of forest pathology more than anything else: they are the microscope, which has made it possible for the structure of microscopic tissues to be determined; and the development of means for the growing of parasitic organisms in pure culture. The investigation of parasites, which was made possible in this way, laid the foundations for what was, until very recent times, the popular conception of disease as being caused principally by infecting organisms. Anyone at the present day, doing advisory work in connexion with tree diseases, still finds that, as a whole, the general conception of tree disease is that it is caused

either by a parasite or a pest. Now it is often important to recognise what are the organisms affecting a particular host, and to endeavour to control them, yet if the development of disease is to be understood, and its prevention effectively carried out, the important matters on which information is needed are not what is the parasite or pest concerned with the disease, but what are the conditions under which the host can live satisfactorily, and what is the actual state of the environment it has to endure. Very rarely indeed can these questions be satisfactorily answered; but the important thing is that it shall be recognised that the production of a satisfactory answer is the main object of research.

If efficient means of avoiding disease and maintaining the forest in a healthy state are only to be developed when the life of the organisms constituting it is fully understood, then there is hardly any branch of biological study which at some time or other the pathologist does not need. Progress in the understanding of disease thus waits to a very great extent on advances in knowledge of other aspects of the life of the plant. One of the marks of the present day is, perhaps, an increasing realisation that this is so. Thus it has been usual to call one who investigated plant diseases a mycologist, because in the past he dealt so largely with fungal parasites. At the present day, however, one has also to deal in forest pathology with virus and bacterial diseases and non-parasitic disease is seen to be of increasing importance. The forest pathologist is therefore no longer merely a mycologist; indeed with certain aspects of mycology he has little or nothing to do.

Nothing is more typical of modern forestry than the increasing attention that is being paid to the provenance, or origin, of the seed used for regenerating the forest. The matter is one of long-standing importance, but came especially to the front when during the nineteenth century the increase in transport facilities made it possible to carry seed with comparative ease from one country to another. The Scots pine provides an excellent example in this respect. As is well known, this tree is indigenous in Scotland and, in certain parts at least, it is, and always has been, possible to obtain seed from native trees, although the quantity may sometimes be rather limited. Nevertheless, even in localities where native stands occur, plantations may be found in which the trees are of a different type and which have been raised from seed of Continental origin. In England, as a rule, no one knows the origin of Scots pine, the plantations having been usually raised from seed indiscriminately bought or from plants, on the origin of which there has been no check. What does it matter where a Scots pine comes from? From the pathological standpoint,

it may matter a great deal, and for this reason, that a Scots pine which is native to one part of Europe is not of necessity suited to another.

The Scots pine is a very widely distributed species and extends from the north of Europe to the Alps, and from Scotland to N. Asia. It has long been recognised that over this large area the species is not of one homogeneous type but that it may be divided into varieties which differ from each other to a greater or less extent. The varieties that thus occur have been recognised as subspecies, and given more or less well recognised names. For example, there is *Pinus silvestris lapponica*, a form occurring in the north of Sweden and in nearby countries at the same latitude ; and *P. silvestris septentrionalis*, which occurs further south, in central and southern Sweden. Other varieties could also be named. They differ from one another in a number of ways, such as colour of needles, angle of branching, rate of growth and shape of crown. In the locality to which it is native each variety produces a reasonably good type of tree, at least on the better sites. If, however, seed is collected from localities widely scattered over the area of distribution of this species, and is sown at one place, it will be speedily found that a variety which had particular characteristics in one part of Europe does not of necessity fully maintain them when growing in another. Thus if one sees Scots pine forests of good quality in southern France, Hungary, or some other part of the Continent, one cannot assume that seed from these trees will produce equally good stands in Britain. On the contrary, one may find that such stands are of a decidedly bad type.

The lack of ability of a tree which is of good habit in one part of Europe, to produce an equally good type of growth in many other parts of the same continent, is reflected not only in such things as straightness of stem, rate of growth and type of branching, but also in susceptibility or resistance to disease. The inferior habit of growth of trees descended from parent trees of good habit in their native country, may, indeed, be taken as a symptom that its present habitat does not suit the tree, nor provide the conditions necessary for good growth.

A question which of necessity arises here is, what are the causes of the differences in habit of growth and resistance to disease exhibited by a tree when it is thus moved from one part of a continent to another or even in some cases from one part of a country to another ? A number of factors may come in, but it can hardly be doubted that the basic and important one is to be found in the difference in climatic conditions between the locality to which the tree is native, and that to which it has now been moved. One or two examples may be

taken in illustration. A Scots pine which is native to southern and central Sweden enjoys a milder and shorter winter than one which is native to the north of Sweden. It is thus adapted to a longer growing season than the north Swedish tree, and in general to a warmer climate, and this is inherently reflected in its constitutional make up. If southern Swedish seed is taken up to the north of Sweden the trees produced from it do not adapt themselves to the climate there but endeavour to grow as if still living in their native habitat. The differences between the two climates are so great that physiologically the trees cannot be satisfied, and they accordingly become diseased. One of the most striking results of this is seen in their susceptibility to autumn and winter frosts. This is partly because they are native to a part of the country where the winter is less severe, but also because they fail to ripen their shoots in a climate where the growing season is so much shorter than that to which they have become suited.

Langlet, in a recent paper (Ref. 9) on the variation of the Scots pine in Sweden, in which he records the results of work done on young seedlings grown from seed collected in various places throughout the country, is able to show that there are definite differences in structure and in physiological constitution according to the locality from which the seed has been obtained. Thus the proportion of the dry weight to the fresh weight of one-year-old Scots pine seedlings, varies from between 31 and 32 per cent. in the south of Sweden to about 36 to 37 per cent. in the north. The pines of Norway, Finland, Russia and Germany show similar variations, according to the climate of the locality to which they are native. The extremes of all the provenances tested by Langlet are northern Spain, with the dry weight 27 per cent. of the fresh weight, and northern Norway where the corresponding figure is 39·6 per cent.

In the same way that the dry weight varies, so does the sugar-content of the tissues; the content in catalase (an oxidising enzyme); the resistance to cold; the rate of growth and the period of growth. Thus the more southerly trees grow faster than the more northerly ones, unless conditions are too bad for them, while they also have much the longer growing period. The variations of the several matters here mentioned are inter-related; *e.g.*, the shorter the growing period (which Langlet reckons as all those days on which the mean temperature reaches or exceeds 48°F.), the higher is the dry-weight percentage.

One sees, thus, that trees which are indigenous to any particular locality have a constitutional character which especially fits them for the climatic conditions which are typical of that place. Not infrequently, also, they become

suited to particular edaphic or soil conditions which are related to these. If a tree is moved out of its typical or normal habitat it runs the risk of becoming diseased, and if the climate is sufficiently abnormal for it, then a diseased condition always develops. An example may be taken from Langlet's paper; a race of pine which, at a latitude of 56° 40′N., successfully overwintered to the extent of over 90 per cent., only managed to survive to the extent of about 50 per cent. at latitude 64° 10′N., and to about 5 per cent. at latitude 67° 8′N. Thus the range of any particular strain of pine is limited, if only by the climate which it is able to endure. The difficulties which a pine placed outside its normal habitat has to face, are, however, not confined to diseases of non-parasitic origin. It is found, thus, that the further north a pine of southerly origin is taken, the more is it subject to needle-cast diseases caused by *Lophodermium pinastri* and *Phacidium infestans*. On the relative importance of the non-parasitic and parasitic factors, as causes of disease, there seems to be a dearth of information, but there can be no doubt that often the ultimate predisposing factor to both is to be found in unfavourable climatic conditions.

Experience in Germany, with Scots pine of different origins, has also revealed that, at any particular place, certain races are especially susceptible to epidemics of needle-cast diseases and that these are usually races which have been brought from a more suitable to a less suitable climatic, or perhaps sometimes also soil, habitat. Thus Schott (Ref. 13) found that, in plots established at Knittlesheim in Rhein-Pfalz, Scots pine from S.W. France and from W. Hungary were the most susceptible to *Lophodermium pinastri*, and Haack (Ref. 5) and others (Ref. 11) have made similar observations. In Germany the northern European races have usually been the most resistant to needle cast, races brought in from milder regions suffering the most, as in Sweden.

The effect of the inherited constitution of a species, race, or variety, in making for susceptibility or resistance to disease, has been observed many times in other species than the pines. The poplars are one of the most interesting genera in this respect. From the timber standpoint the Black poplars are probably the most important group in this country. These include presumed hybrids such as *Populus serotina* Hartig, the common black Italian poplar, *P. marilandica* Bosc., *P. eugenii* Simon Louis, *P. regenerata* Schneider and *P. robusta* Schn., and also the species from which, directly or indirectly, they are supposed to have come, *e.g.*, *P. nigra* L. or one of its forms, *P. deltoidea* Henry and *P. angulata* Aiton. The first four varieties are undoubtedly closely

related and morphologically they exhibit many similar characters. While, however, they have characters in common, they also show differences, and these appear amongst other things in their susceptibility to disease. Thus *P. eugenii* is markedly susceptible to canker in Britain, and also on the Continent and in N. America, and for this reason should never be planted. *P. regenerata* occasionally suffers severely from this disease ; *P. serotina* is often covered with many small cankers, but usually does not suffer appreciable damage ; while *P. marilandica* appears to be practically immune to the disease.

This variation between what are probably closely related forms suggests that resistance or susceptibility is often an inherited disposition. Thus if resistant and susceptible parents are crossed, it is to be expected that their characters will be inherited, and appear in the offspring. With agricultural plants, as, *e.g.*, wheat, this has often been shown to be the case, and with most important results. That it is so with forest trees also, may be taken as certain, and the work of Stout and Schreiner in U.S.A. (Ref. 15) shows that suitable experiments would probably reveal this. They crossed a large number of poplars and raised seedlings from them in an attempt to obtain trees which produced wood rapidly and were resistant to disease. The offspring exhibited the parental characters to very varying degrees. Thus from a cross between *P. balsamifera virginiana* and *P. trichocarpa,* some of the offspring were only slightly affected by the rust, *Melampsora medusae,* although the majority proved to be very susceptible. Similar results were obtained in regard to such things as habit of growth and liability to injury by frost. It is possible, in fact, to select, from a large number of seedlings, trees that have good or bad qualities, and thus in time to obtain especially useful types. The necessity for such careful selection is illustrated by *P. generosa* Henry. This hybrid was obtained by Henry in 1912 as the result of a cross made between *P. angulata* Aiton and *P. trichocarpa* Torr and Gray. The tree proved to be of exceedingly fast growth, as indeed are many of the hybrid seedlings obtained more recently by Stout and Schreiner. It began to be propagated widely owing to the promise of rapid timber production, but soon developed serious faults. In many situations it has proved liable to have its top broken by the wind ; also its leaves are very susceptible to the rust, *Melampsora laricis* ; and it is susceptible to canker. In addition to this, it is liable to be injured by frost, and especially by spring frost, the damage usually taking the form of cutting back the twigs. Because of these faults its cultivation has largely been abandoned ; this example, indeed, shows how careful one has

to be before accepting any new form, variety or species for general cultivation. The matter is, however, of more interest than this. Experience in this country shows that *P. trichocarpa* possesses the faults of its offspring, though not of necessity to the same degree. It is very liable to have its top broken by wind ; it is probably equally susceptible to canker, though rather less so to leaf rust than *P. generosa.*

P. angulata, on the one hand, has so far shown none of the defects ; on the other hand, it has not proved to be of value as a timber tree. If a large number of seedlings representing the cross *P. angulata* × *P. trichocarpa* were raised, there would probably be some which possessed the timber-producing qualities of *P. trichocarpa,* with the disease resistant powers of *P. angulata.*

Natural hybrids are of common occurrence among many of our forest trees, as *e.g.* among the elms, willows and oaks. Sometimes, as in oak, it is indeed difficult to find the pure species. In most parts of this country the common oak is a hybrid between the pedunculate oak, *Quercus robur* Linn., and the sessile oak, *Q. sessiliflora* Salis , the character of one or the other being more or less dominant. Now two of the most serious troubles of oak, in Britain, are the defoliation caused by various moth caterpillars (such as *Tortrix viridana,* the oak tortrix moth, and *Cheimatobia brumata,* the Winter moth) and the infection of the leaves by mildew (*Microsphaera quercina*). Both our native species of oak are susceptible to these troubles, but the pedunculate oak is the more seriously affected. One reason for this is, apparently, to be found in the date of flushing of the leaves. On the average, the sessile oak flushes earlier than the pedunculate, and its leaves tend to become hard and mature before the moth larvae have reached their period of maximum destructiveness, or the mildew spores have become widely spread. In any wood of hybrid oak, one factor which affects the liability of the trees to disastrous epidemics of defoliation, or of mildew attack, is the extent to which the sessile character is dominant among them. On walking through a wood after such an epidemic it is usual to find that the less affected trees have sessile characters more or less predominating.

Work carried out on the Continent during the last 30 years has shown, however, that the susceptibility of the European oaks to disease is not merely a matter of difference in character between species, but that, as in the Scots pine, different races of oak occur, and each of these, according to the habitat in which it is grown, is more or less susceptible to various affections. The most extensive experiments appear to have been carried out in Denmark (Ref. 6), but certain work has been done in Austria (Ref. 1). Both show similar results. Denmark

is in the same latitudes as northern England and southern Scotland. It is in the northern part of the area over which the pedunculate oak is found, and one of the chief troubles in regenerating oak there is the infrequency of good seed years, and the consequent difficulty of obtaining a good supply of acorns. To this is added the difficulty that the Danish oak forests have been selectively felled for centuries, the better and straighter trees being taken in preference to the shorter and more crooked ones. The result is not only that seed is liable to be short, but a great deal of what is available comes from trees that exhibit a bad type of growth. It is a matter of experience, that seed obtained from tall, straight-growing, small-crowned trees produces more trees of this type than does that obtained from lower-growing, crooked, and spreading-crowned trees. That is to say, habit of growth does not depend entirely on the conditions under which the tree happens to have been placed, but also depends on its inherited constitution. Oppermann points out that oaks with the shorter and more spreading type of crown are those that tend to develop in the more exposed places. Thus, as one goes inland from the coast in Denmark, a series of types may be found, from the short and very crooked, spreading tree, to the tall, straight-growing, and comparatively small-crowned tree. Any attempt to grow the latter type of tree in localities to which only the former is suited would be doomed to comparative failure, since the good form could not be produced satisfactorily under such conditions, and the trees would inevitably become damaged, diseased and of bad shape.

Of equal interest, from the silvicultural standpoint, is the growth, at one place, of seed obtained from various parts of Europe. The obvious way to remedy a shortage of native acorns is to import foreign seed, and in Denmark this has often been done in the past. Care was taken in all cases to import the seed from trees of known type. The frequent failure of this seed to produce trees of equally good habit to those from which it was taken, led to the laying out of experimental plots to test the importance of place of origin in the selection of seed. The acorns of foreign origin all came from trees of good habit and tended to produce a greater number of straight stems than those raised from native seed; in some cases they flushed earlier and in other cases later than the native trees; they had a longer growing season than these, being especially marked by the continuance of growth into the autumn, and the consequent frequent failure to ripen the shoots before the frosts came. They had a greater tendency than the native forms to form lammas shoots, this being very marked in some cases; their twigs were much more slender than those of native trees,

and their buds were much smaller. The more closely the climate of the place of origin resembled that of Denmark, the more similar was the manner of development of the shoots to that of the native trees. Thus, of the provenances tried, seed from the Netherlands proved to produce trees of the most similar type of growth. The Austrian experiments gave essentially similar results.

From the pathological standpoint all this is very important, and, indeed, becomes more so when it is realised that not only are there differences between trees produced from native Danish seed, and those from foreign seed, but that appreciable differences in constitution occur between oaks grown within the area of that rather small country. Thus the oaks native to Zealand, with a relatively mild climate, show some of the faults of oaks of foreign origin, when set in the middle of Jutland, which has a cooler and more severe climate (Ref. 7). The relation between manner of growth and disease may easily be seen: thus a race of oak which constitutionally is suited to a longer growing season than is afforded by the climate of the place in which it is growing, inevitably suffers, in north temperate latitudes, from frost injury to its shoots. It is obvious that, if this type of injury is sufficiently severe, much damage may result to the tree, but even comparatively slight damage is often of much importance. Thus, in this country, oaks commonly suffer much from the death of the tip of the leading shoots. There appears to be more than one cause of this, but there is no doubt that much of it is frost damage. Danish experience confirms this: it was found there that injury to the tips of the shoots, or, in the case of the more susceptible races, to the whole shoots, was one of the principal forms of damage. The repeated killing of a small portion of a shoot would not appear, in itself, to matter much. Its importance lies, however, in the fact that it causes the repeated forking of the leading shoot, and that this results in the production of crooked stems from what is, under good conditions, a straight-stemmed race.

There is also a very intimate relation between the manner of growth of the tree and its susceptibility to oak mildew. As is well known, this fungus overwinters in the buds. The shoots which develop from such buds appear covered with mildew in the spring, and infection spreads from them to the rest of the tree. The oak develops its first shoot quickly however and, unless conditions are favourable to the fungus, the leaves become mature and resistant to infection before it has been able to reach many of them. If, now, there is little or no further production of lammas shoots, the development of the parasite will not seriously affect the tree.

But, if for any reason there is an abundant formation of such shoots, then there may result a very heavy infection with mildew on the young developing leaves, since these latter are very susceptible. Thus native Danish oaks produce no, or compared with foreign oaks grown in Denmark few lammas shoots, and for this reason they are less liable to injury by mildew.

The defoliation of oak by caterpillars is a further complicating factor in regard to mildew infection. Oaks which have been so affected produce a second and late crop of shoots. If a tree has been severely defoliated practically all its leaves are formed in this manner. In bad seasons, as when hot dry weather succeeds heavy infection, such leaves die soon and fall early. The growth of the tree suffers as a consequence and if, as sometimes happens, this sort of thing occurs for several seasons in succession, the food reserves are exhausted, the length of shoot and size of bud are reduced, and the root system begins to die back. In this way the bad condition and frequently the dying back of oak in this country are chiefly to be explained.

A broad branching habit of growth, which, as seen above, is especially marked in some races of oak, may also be a predisposing factor to disease, and through this, to economic loss in the forest. Fungi causing decay enter the tree principally through the roots or the crown. In the latter case, the chief means of entry are dead or dying branches of some size—that is to say, branches which are large enough to contain heart-wood. Thus an oak which forms a wide-spreading crown will develop large lower branches sooner than one which is of taller habit, and has a narrower crown with finer branches. With oaks of the former type, the crowding of the trees together while young will tend to correct the bad habit of branching, but it will be found in practice that it never entirely overcomes it. The result is that in the forest they tend to become susceptible to infection in the heart-wood, by fungi causing decay, at an earlier age than do trees with a better habit. When to this bad habit is added the debilitation caused by defoliation by caterpillars, and by infection by mildew, the losses caused by heart-rot may be very considerable.

From the discussion above, it will be seen that between related species, or their varieties or hybrids, differences in constitution occur, which are reflected both in manner of growth and in physiological reactions. Resistance or susceptibility to disease depends, in part, on the physical environment of the plant being suited to its constitution. Thus, when introducing exotics or even selecting seed from native trees, it is important that the habitat to which the trees are being introduced shall be suited to them. If the climate to which

they are native differs markedly from that occurring there, it may be taken as certain that they will show an unusual susceptibility to disease, and probably also differences in habit of growth will occur, as compared with the manner of development in their native habitat. There is, thus, if trees are to grow up healthily, a comparatively narrow range of climate from which seed may be taken for growth at any particular place. It has been seen that if a Scots pine or an oak is taken from a warmer to a cooler climate there is danger from frost injury, especially during the autumn and winter. If, however, the reverse takes place, and trees are brought from arctic to temperate latitudes, or from a high to a low elevation within much the same latitude, they tend to flush too early, and to be injured by spring, or even by late winter frost. The larches which are native to arctic or semi-arctic climates, such as *Larix siberica* Ledeb, or *L. Gmelini* (Rupr.) Gordon, cannot be grown here successfully because of this. The chief weakness in the character of the European larch, so far as this country is concerned, is its habit of flushing early, at the end of the winter or beginning of the spring. Because of this, it is continually subject to frost injury, and, largely depending on this, to the canker disease (Ref. 3). The early flushing takes place because the larch is native to climates which differ markedly from that obtaining here, in that the winter is colder and longer, and the spring and autumn, during which intermittent warm and cold periods occur, are much shorter. In consequence of this, it becomes here a tree with a longer growing season than the climate permits with safety, or than the indigenous trees usually have.

A slight constitutional incompatibility of the tree to its environment may thus be all important in creating susceptibility to disease. It may further, under conditions of natural regeneration, result in a selective influence being exercised, which eventually results in the elimination of the susceptible types. The common spruce provides an illustration of this. Anyone who observes a nursery bed of spruce plants will find that markedly early- and late-flushing types occur. If specimen trees are marked and watched during subsequent years it will be found that the habit of early and late flushing is constant. If spruce is used for regenerating frosty areas, the trees which will grow most satisfactorily are the late flushing ones, the reason for this being that, to a great extent, they escape being cut back by late frosts (Ref. 3). If now, such areas are naturally regenerated there will be a strong tendency to produce a locally pure race of late-flushing spruce, owing to the continual selective action of the frost. Under natural regeneration this selective action of disease is continually taking place, but under artificial regeneration the selection of the strain is a matter for the

management of the forest. For this reason it is extremely important to know what is the provenance of any seed or plants used.

So far disease has been considered in relation to the constitution of the tree and the climate in which it grows. Meteorological conditions determine the environment in which the crown of the tree exists, but they decide only in part the condition of the soil which provides the environment of the root. In any given climate this is a chief factor in deciding whether trees shall be healthy or not. The newly planted tree presents a special problem, in that the root is necessarily more or less damaged in transplanting and moreover is reset, even if the greatest care be taken, in a position very different from that which it had before lifting. Under these circumstances the regeneration of its root system is more important to the plant than anything else. On many soils this takes place without trouble, provided the planting is done reasonably well and the weather conditions are not too bad. In other places, however, great difficulty may be experienced. The results of attempting to grow trees on some of the more infertile peats, as described by Laing (Ref. 8) and Fraser (Ref. 4) provide examples of this.

On the more fertile acid peat soils, trees may be established with comparative ease, but on those that are less fertile great difficulty may be experienced. The newly planted trees either fail to grow or, after a period of very moderate growth, go into check. In this condition they make little or no growth, often lose a great part of their leaves and take on a very bad colour. These are symptoms of a diseased state, the cause of which is to be found in the nature of the soil. It is natural for plants to form mycorhiza when growing on a soil containing a high proportion of organic matter. There would appear to be no doubt that the great advantage to the tree in the mycorhizal relationship is that by its means nutrient substances can be absorbed, which are bound up in the organic debris and cannot be taken up satisfactorily by root hairs (Ref. 10). Tree roots growing in a fertile peat will thus not only absorb nutrient material, but in so doing will break up and hasten the destruction of the peat itself. Laing observed that the formation of mycorhiza on acid peats is largely dependent on sufficient aeration and on the presence of mineral bases, the two things being interrelated. In the absence of sufficient air, no mycorhiza is formed and the plants attempt to function by means of root hairs. If the peat is aerated but lacking in mineral bases, mycorhiza may be formed but it will be of an inferior type. In these things is to be found the cause of the diseased state of the trees, and it seems plain that cultivation

involving the mechanical breaking up, draining and manuring of the soil is probably the quickest means of removing it. The expense of doing this may be prohibitive, however, and then one hopes that by the slow development of the species that are the more hardy to such conditions, a gradual change in soil type may be induced which will permit the growth of other and usually more valuable trees.

Most soils with which the woodland owner in England has to deal are not of so difficult a type as these infertile peats. Nevertheless it is no uncommon thing for conditions to arise which prevent root development or cause the root to die back. With newly regenerated areas, bad planting is often blamed for such failures. It is, of course, always better to plant well than ill, but that the failure of the newly planted root to regenerate is due more to the condition of the soil than to the planting method, may be tested by planting trees badly in a garden soil in good condition. The maltreatment will have to be very severe for the root to fail to grow, provided that it has been lifted and transported with care.

It is necessary, therefore, to maintain the forest soil in such a state that the healthy growth of the root is possible. This, indeed, presents the forester with one of his greatest problems. The maintenance of a perfect soil is, like the establishment of a perfectly proportioned growing stock, an ideal which should be continually striven after, even if rarely achieved. The failure sufficiently to achieve it is reflected in a number of things, such as an unnecessarily low rate of increment, the development of a bad habit of growth, general lack of vigour such as is shown by the failure to recover rapidly from injury: the dying back of the crown as a reflection of the unhealthy state of the root, and the development of heart-rot.

Speaking generally, unsuitable soil conditions are reflected in the tree in a lack of the ordinary healthy vigour of growth and in an increased susceptibility to disease. The factors concerned may be classified under a very few headings. There is thus, lack of air, such as commonly occurs on undrained soils, very heavy or clay sub-soils; lack of water, to which even in this country, a variety of soils are liable in dry seasons; the presence of toxic substances, such as was demonstrated by Laing (Ref. 8) for some peat soils and, as is well known, occurs in strongly saline or alkaline soils; and deficiency in some necessary nutrient substance.

It is unusual for soils to be actually deficient in the substances necessary for growth, although they may be in such small amount that the rate of growth is limited; or, owing to the nature of the soil, these substances may not be available to the plant. It is for this reason that foresters have been forced

sometimes to give a minimum of cultivation and in some cases even manuring, as by the mixing of raw humus with the mineral soil or, as on poor sands in Belgium or peat in this country, by the addition of mineral fertilisers such as basic slag. Sometimes, however, a disease is traceable directly to a deficiency of a particular substance. The African disease of the tea plant known as "tea yellows", for example, has been found to be caused by a deficiency of sulphur and can be remedied by the suitable application of this (Ref. 14).

The most important of the conditions here under consideration are undoubtedly lack of water and lack of air ; frequently related to the latter is the presence of toxic substances, owing to the failure of mineral or organic matter to become fully oxidised. Neither deficiency can always be easily recognised. Frequently root parasites attack the injured or weakened trees and, being the obvious cause of disease, mask the deeper and more fundamental factors which have made their successful attack possible. Rayner (Ref. 12) points out, for example, the relation between a favourable condition of the soil and the presence of mycorhiza as a benefit to the plant. Under unfavourable conditions, the mycorhizal fungus either becomes parasitic or is replaced by parasitic or semi-parasitic pseudo-mycorhizal fungi. The feeding rootlets then become impaired or die and the plant suffers accordingly. Such a thing as this can only be detected as the result of careful examination under the microscope, and much has yet to be learned as to the conditions under which it occurs.

In many parts of the country the beech is suffering seriously from disease (Ref. 2). The localities affected are of at least two different types. First, one has the beech growing on thin soils over hard chalk, as not uncommonly occurs on the chalk hills in the southern part of the country. The general symptoms of disease are that the leaves turn colour and drop early, the crown begins to die back, and often cankers appear on the stem. The beech coccus, *Cryptococcus fagi*, often occurs in great numbers on the bark, and various fungi, such as *Nectria ditissima* and *Bulgaria polymorpha*, are found on the dying branches and cankers. An examination of the root shows that it also has begun to die-back, although no special fungus has so far been found to be particularly connected with this. One has thus a disease which is associated with at least one pest and several possible parasites. Observation shows, however, that it occurs almost entirely on particular sites, as mentioned above, and that it is always worst after very dry years. There can be no doubt that here one is dealing with a disease in which the pests and parasites are of secondary importance, the fundamental cause being simply lack of water. With diseases

of this origin it is not uncommon for the trees to grow up to a good size before they become affected. This is usual with the beech. The age at which the trees become affected would appear to depend chiefly on two things. First, the older tree makes a bigger demand for water than the younger one and therefore the latter tends to escape any serious damage ; second, dry seasons come rather irregularly, their duration and severity is variable, and it is upon these things that the severity and frequency of the disease depend.

The other type of locality in which the physical condition of the soil plays a large part in the development of disease in beech, is where the soil tends to be wet or very moist, either because drainage is difficult or because the soil is very retentive of moisture. Trees growing on clay soils, or where water seeps out from the edge of a cap of permeable soil, are in this case especially liable to be affected. In such places, either the soil is always moist, or it is at one time sodden and at another nicely moist or perhaps too dry. Even with careful attention to drainage it is often extremely difficult to control the water conditions at such places. The trees which become diseased show very similar symptoms to those described above, so far as the crown is concerned. An examination of the root shows that in this case it also has died back, but, if careful cultures are made, fungi can be isolated which can be shown to be parasitic. So far two species, *Phytophthora cambivora* and *P. syringae* have been isolated from beech roots dying back in such localities, and inoculation experiments show beyond doubt that both are parasitic and capable of causing the root to die back. Here again, however, there seems to be no doubt that soil conditions play a great part. For instance, on these wet sites or water-retaining soils, there is a great tendency for the finer rootlets to die from lack of air during the periods when the soils are most wet. Observation in the field indicates that this undoubtedly takes place. Also the Phytophthoras are moisture-loving fungi and are sensitive to the drying out of the soil. They thrive most, therefore, in those places where the soil is permanently moist and such a condition predisposes trees to their attack. One finds here, perhaps, one of the chief reasons why beech growing on the lighter and better drained fertile soils is so very much less liable to infection.

A much more serious disease of the sweet chestnut is caused by the same Phytophthoras which attack the beech. It is known as the "Ink Disease", owing to the ink made by the mixture of the tannin from the dead bark and the iron in the soil. Because of this, in soils that contain any appreciable amount of iron, the roots affected and the soil surrounding them turn blue-black. In addition to the two species mentioned

above *P. cinnamomi* also attacks the chestnut. The influence of soil on this disease is much the same as in the case of beech. On heavy soils such as occur in some places on the Old Red Sandstone in Herefordshire or on the clays in the New Forest, the disease is at present so serious that it threatens to destroy much of the chestnut in the affected areas. On lighter and drier soils, however, it seems to be very much less virulent and so far has not been found in this country on well drained sand, although it may easily occur there to a slight extent. It seems, therefore, that these Phytophthora diseases of beech and chestnut may be avoided to a great extent by confining planting to the less wet and better drained soils. In France and Italy where the fruit of the chestnut is at least equally as important as its timber, the Japanese chestnut, *Castanea crenata,* is being substituted for the common European species on account of its resistant qualities, but there is as yet no evidence of its value here as a timber tree either in coppice or high forest.

Finally, mention may shortly be made of the connexion between soil conditions and the development of heart-rot (Ref. 2). The fungi which cause this enter the tree either through wounds or branches in the crown, or through dead or wounded parts of the root. It is with heart-rot entering in the latter manner that we are concerned. The fungi responsible for this are, in conifers, chiefly *Fomes annosus* and *Polyporus schweinitzii*. *F. annosus* is the more important of the two species, and upon occasion it can cause a very appreciable amount of loss. If an examination is made of the localities affected by heart-rot coming up from the root, it will be found that it occurs on soils in which rooting conditions are difficult. What seems to happen is that up to a point the root develops healthily; then some change takes place which causes it to die-back, and it is through the dead portions that the heart-rotting fungi enter. There are at least two types of site on which this happens. In the one the controlling adverse factor is to be found in extreme variations of the water content, and in the other in the gradual reduction in the aeration of the soil (Ref. 2).

The circumstances under which these factors act are very variable, and have as yet been but little surveyed. A typical difficult site occurs where a thin, permeable and easily drained stratum overlies an impermeable one. Here the water-table in the soil is apt to be fairly near the surface, but at the same time may vary much in height throughout the year. The root grows down approximately to the lower limit of variation of the water-table, but when this rises, the smaller rootlets within the limits of the rise usually die owing to lack of air in the water-sodden soil. Should the rise be too long maintained

the larger roots may die, and thus open the way to heart-rotting fungi. Conversely, the soil being easily drained, the upper layers dry out quickly in times of drought, and the roots in it are then liable to die owing to lack of water. Sites may be found showing many variations of this sort of thing, and wherever it occurs heart-rot coming in through the root is always liable to result.

The other condition, in which there is a gradual deterioration in the aeration of the soil, also occurs not uncommonly. The failure of a drainage system may, for example, bring this about. Undoubtedly the roots of trees and especially those of conifers are especially liable to suffer in this way on the heavier soils. The accumulation of a layer of raw humus, especially if it tends to consolidate into peat, also acts in this way. This is, perhaps, especially liable to happen on acid soils where conifers have replaced hardwoods. Species such as the common spruce appear to have an especially bad effect. The plantation begins growth with the soil in a more or less open condition, and the root penetrates as far as the aeration and texture of the soil will allow. With the deterioration of the surface conditions consequent on the accumulation of a raw humus or peaty layer, the conditions for growth lower in the soil also deteriorate. To a certain extent a die-back of the root becomes inevitable and as a consequence of this the road is thrown open to heart-rotting fungi.

Losses through heart-rot developing in this manner can be avoided only by understanding the conditions that exist in the soil, the reaction of the roots of the various species suitable for afforestation to them and the effect of the species themselves on the soil. There is an immense amount of research to be done in this connexion. Indeed the amount of certain information that is available for one's guidance is exceedingly limited. The best advice that may be given at present is, perhaps, to choose species which, so far as can be ascertained, are suited to the site ; so to manage the plantations that the vigour of growth is maintained as fully as the locality permits ; and to see that the surface of the soil is kept in good condition. This entails paying proper attention to choice of species, to thinning, to drainage and other such necessary silvicultural measures.

In this discussion an attempt has been made to show that there is an intimate relationship between the constitution of the tree, the environment in which it lives and the development of disease. This is of course obvious ; it is, however, apt to be forgotten, and disease is still regarded in far too many cases as being merely a reaction between the host and a parasite. With trees as with other living organisms, the development of

a state of disease is frequently the result of the interaction of a number of factors adverse to the healthy development of the organism, or if the disease is, at least in part, of parasitic origin, favourable to the parasite. In considering disease one should, therefore, not be satisfied with determining the effect of one particular factor on the health of the tree, but should examine the effect of this in relation to the general environment in which the tree lives and to the character of the tree itself. Thus, in the apparently simple case of injury by frost, the seriousness of the damage done frequently depends, not so much on the extent to which the tree is cut back, as upon its powers of recovery after the injury. In this, a rapidly growing tree may have an advantage over a slower growing one; and a tree which up to the time of damage was healthy and vigorous will have a great advantage over one that was then in a more or less debilitated state. It has been seen that the moisture content of the soil has apparently some controlling effect in relation to the infection of beech and sweet chestnut with *Phytophthora* species. Similarly a dry hot summer may very appreciably lower the incidence of fresh infection of five needled pines with the rust fungus, *Cronartium ribicola*, in that favourable conditions for spore germination are of much less frequent occurrence than in more humid seasons. It is perhaps typical of forest pathology at the present day that an attempt should be made to take this wide view of the origin of disease; and this is particularly hopeful because it means that in the end a much fuller and more accurate view will be obtained of the conditions that are necessary for the healthy development of our woodlands.

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THE ECONOMIC VALUE OF POULTRY ON THE FARM.

I.—Increasing Attention Now Being Given to Poultry.

A study of the records of the poultry kept on farms with which we have been intimately in touch, during the last fourteen or fifteen years, brings out a number of points well worthy of notice. During this period we have had under observation the records of 113,976 laying birds, and in recent years the average number has been roughly 12,000 per annum.

Increase in Output.—The increasing importance that is being attached to poultry is shown by the fact that whereas in 1921–22 eggs and poultry products formed little more than 2 per cent. of the monetary value of the output of the holdings, these formed, in 1932–33, no less than 9 per cent. of the total.

OUTPUT OF POULTRY PRODUCTS.

Year.	Total per 100 acres of cultivated land. £ s. d.	Per cent. of Total
1921–22	22 2 9	2·1
1922–23	19 11 11	2·6
1923–24	24 5 3	3·1
1924–25	27 16 4	3·4
1925–26	30 7 9	3·9
1926–27	32 5 9	4·1
1927–28	32 1 0	4·4
1928–29	45 18 1	5·9
1929–30	47 7 6	6·2
1930–31	60 0 0	8·4
1931–32	58 5 10	8·8
1932–33	72 6 10	9·0

Statistics published by the Ministry of Agriculture and Fisheries, dealing with the Agricultural Output of England and Wales, show that similar developments have been proceeding throughout the country as a whole. In 1908 the value of eggs and poultry produced in this country was estimated at £5 million, representing 3·3 per cent. of the total agricultural output. In 1925 their value had increased to £17·7 million, or 6·6 per cent. of the total, and in 1931 to £21 million or 10·4 per cent. of the total.

Increase in numbers.—The increased monetary value of the poultry products, notwithstanding a drop in the selling price of eggs from 4*s.* a dozen in 1920–21 to less than 1*s.* 2*d.* a dozen in 1932–33, has been brought about partly by a marked increase in the number of birds kept, and partly by a still more marked improvement in their management.

The number of birds kept on the Yorkshire holdings under investigation has increased from 87 per 100 acres of crops and grass in 1920–21, to 239 per 100 acres of crops and grass in 1932–33—an increase of roughly 150 per cent.; and a study of the Fourth of June Returns, as published by the Ministry of Agriculture and Fisheries, reveals the rapid growth in the poultry population of the farms of England and Wales, the number being more than doubled during the last twelve years.

NO. OF POULTRY ON THE FARMS OF ENGLAND AND WALES.

Year.	Total No. of Fowls.
1913	29,026,000
1921	24,816,000
1924	30,755,000
1926	36,563,000
1927	39,491,000
1928	39,916,000
1929	42,757,000
1930	47,901,000
1931	52,564,000
1932	57,747,000
1933	61,171,000
1934	61,310,000

Younger Birds being kept.—Younger birds are now being kept, and flocks are being culled much more drastically. Three- and four-year-old birds of the barn-door type, which were in the ascendancy ten or fifteen years ago, are now a relic of the past.

AGE COMPOSITION OF POULTRY FLOCKS—YORKSHIRE RECORDS.

	Per cent. of Total in the Flocks.		
	1921–22.	1929–30.	1932–33.
Three-year-old birds and older	39·0	7·0	1·0
Two-year-old birds	36·0	38·0	34·0
Pullets	25·0	55·0	65·0

Increasing egg production per laying bird.—Coincident with the increase of the number of birds there has been a corresponding improvement in egg production which averaged :—

75	per laying	bird in	1921–22
99	,,	,,	1929–30
103	,,	,,	1930–31
110	,,	,,	1931–32
124	,,	,,	1932–33

Increasing winter egg production.—What is possibly more important than the rise in annual production is the striking improvement in the egg production during the months that really matter—the winter period, when prices are comparatively

high. In 1921–22, on the farms whose accounts we had under investigation, 88 per cent. of the total number of eggs were produced during the six summer months (March–August inclusive), and only 12 per cent. during the six winter months. In 1929–30 the winter egg production had increased to 20 per cent., and in 1932–33 to no less than 45 per cent. of the total.

YORKSHIRE RECORDS.
EGG PRODUCTION 1932–33—PER CENT. OF TOTAL.

	Summer. Period.	Winter Period.
March	12·3	—
April	13·1	—
May	11·0	—
June	7·4	—
July	6·2	—
August	4·6	—
September	—	4·3
October	—	7·4
November	—	7·8
December	—	8·5
January	—	7·1
February	—	10·3
Total	54·6	45·4

Earlier incubation.—There are evident statistical signs that the hatching season has been advanced, with the result that quite a large proportion of the earlier-hatched pullets are in full lay about the beginning of October.

Better housing.—A study of the live- and dead-stock valuations shows that the birds, not only on the specialised poultry farms but also on the ordinary commercial mixed holdings, are now much better housed and equipped. Fifteen years ago, on the farms with which we were in touch, the dead-stock, housing and equipment provided by the tenant farmer for his poultry stood in the books at an average of less than 1*s*. 6*d*. per laying bird. In 1932–33 they stood on the average at 6*s*. 8*d*.

Modifications in methods of feeding.—Possibly the most striking modification in the management of poultry has been in the matter of feeding. If our records are to be relied upon there would appear to have been little alteration in the quantity of concentrated foods fed per bird, but a very marked change in their type. In 1919–20, 90 per cent. of the total food was in the form of cereals and similar foods (rich in carbohydrates but of low protein- and mineral-content) a proportion which by 1932–33 had been reduced to 49·8 per cent.

The birds as originally fed were being given a ration in which the ratio of protein-equivalent to starch-equivalent would

be approximately 1 to $8\frac{1}{4}$. Such a ration, it is now known, is quite inadequate to the production of a high output of eggs. The defects in rationing have now, to a large extent, been rectified either by the increased use of foods possessing a higher protein- and mineral-content, or else by the substitution of balanced proprietary foods, the use of which has of late years grown rapidly.

The average 1929–30 ration not only possessed a higher mineral-content, but also had a very much narrower ratio of protein-equivalent to starch value—roughly 1 to 6 instead of 1 to $8\frac{1}{4}$ as in the earlier-mentioned period.

Our records for 1931–32 suggest that the change in method had gone a stage further, the foods consumed by the poultry consisting of :—

Food Type.	Variety.	Per cent.
Carbohydrate Foods low in Protein and Minerals	Cereals	38·4
	Maize Products	16·7
Foods of Medium Protein- and Mineral-Content	Proprietary Foods	23·8
	Wheat Offals	14·8
	Maize Germ Meal	1·2
High-protein Foodstuffs of Animal Origin	Fish Meal	1·4
	Meat Meal	0·4
	Dried Milk	0·2
High-protein Foodstuffs of Vegetable Origin	Soya Meal	1·7
	Alfalfa Meal	0·6
Minerals	——	0·8
Total		100·0

This average ration would possess a protein-equivalent : starch-equivalent ratio of approximately 1 to 5 as compared with 1 to $3\frac{1}{2}$ or 4 in the case of some of the balanced proprietary poultry foods on the market.

The revolutionary changes that are taking place in the feeding of poultry can be seen by reference to the following summarised table.

YORKSHIRE RECORDS. FEEDING OF POULTRY.

	1919–20.	Per cent. 1929–30.	1931–32.
Carbohydrate Foods low in Protein and Minerals	90·0	67·0	55·1
Foods of Medium Protein- and Mineral-Content	9·3	29·0	39·8
Foods of High Protein- and Mineral-Content	0·7	3·5	4·3
Minerals	—	0·5	0·8
Total	100·0	100·0	100·0
Ratio of Protein-Equivalent to Starch-Equivalent	1 : $8\frac{1}{4}$	1 : 6	1 : 5

The ordinary farmer has still much to learn on the technical side of poultry management, but he is proving a willing and intelligent pupil, and the strides that have recently been made along the lines of improved technical efficiency in production are most striking.

II.—Economic Importance of Poultry on the Farm.

From the point of view of the economist the laying bird has much than can be said in its favour.

High Capital Turnover.—Over a series of ten years, on the farms whose accounts we have had under investigation, there has been invested a total average working capital of £13 4*s*. 6*d*. per acre; the yearly sales from these farms have averaged £10 6*s*. 8*d*. per acre, giving an actual capital turnover of 78 per cent. These sales, however, include not only what has been produced on the faım, but also in many cases what has been bought in for finishing. Thus in the case of a bullock bought in store condition for £16 and sold out fat for £26, the actual sale would be registered as £26; but the value of the beef produced on the farm would be only £10. When allowance has been made for the store stock bought in, the annual output or production from the farms has averaged, not £10 6*s*. 8*d*., but £7 17*s*. 7*d*. per acre; so that what has been produced for sale on the farm each year has averaged less than 61 per cent. of the working capital invested in the holdings.

During this same period each laying bird, standing in the books at an average value of 6*s*., and with equipment and dead-stock valued on the farm at 5*s*. per head, has produced for sale each year goods to the average value of 14*s*. 5*d*., equivalent to 133 per cent. of the capital invested in live- and dead-stock.

Quick Sales and Ready Money.—Another disadvantage with which the agriculturist has to contend is that, while labour and other running expenses have to be met weekly, cash sales are, in many cases, few and far between. Sales of the various crops may be made only once a year; a fat bullock will most probably be well over two, and possibly more than three years old before it goes to the butcher. Under these circumstances the economic value of the regular weekly income from the sale of eggs is self-evident. Its importance has, for many years, been realised by the women of the family and the men are now beginning to give it tardy recognition.

Possibility of Building up from within.—To-day nine farmers out of every ten are complaining, many with real cause, of shortage of capital. Since 1920 farm values have been constantly falling, farm products which were worth £292 in 1920 being to-day worth only £107; and many men who started

their agricultural careers immediately after the war, in the days of high prices, are finding themselves to-day in none too enviable a position. In such cases attention may be called to the possibilities of poultry as a means of retrieving the position.

On one farm in Yorkshire (Farm A) the first step in poultry husbandry was taken in 1913, when 12 laying birds were purchased at 3*s*. 6*d*. each, and an old poultry house bought for £5. From these small beginnings the present flock of approximately 3,000 birds has been built up, without the addition of any capital apart from that which has been provided by the birds themselves.

FINANCIAL RECORDS OF THE POULTRY ENTERPRISE ON A YORKSHIRE FARM (A). 1913–32.

Year	No of Laying Birds.	Capital Investment: In Live-stock	In Equipment.	Total	Profit: Total	Per Laying Bird
		£	£	£	£	s. d.
1913 . . .	12	2	5	7	3	4 8
1914 . . .	11	2	5	7	5	8 9
1915 . . .	34	3	20	23	21	12 0
1916 . . .	68	23	16	39	27	8 0
1917 . . .	82	21	15	36	46	10 5
1918 . . .	237	87	63	150	246	20 9
1919 . . .	435	181	172	353	359	16 11
1920 . . .	499	187	346	533	481	19 4
1921 . . .	679	253	537	790	723	21 3
1922 . . .	1,056	355	906	1,261	427	8 1
1923 . . .	1,089	305	972	1,277	467	8 10
1924 . . .	1,111	429	920	1,348	366	6 7
1925 . . .	1,275	540	962	1,502	286	3 11
1926 . . .	1,827	572	970	1,542	668	7 3
1927 . . .	2,202	685	1,345	2,030	737	6 8
1928 . . .	2,705	800	1,380	2,180	421	3 8
1929 . . .	2,270	822	1,347	2,169	595	4 3
1930 . . .	2,185	868	1,691	2,559	422	3 0
1931 . . .	3,122	939	1,781	2,720	832	5 4
1932 . . .	2,995	861	1,840	2,701	585	3 11

Thus during this 20-year period the live-stock valuation has been built up from £2 to £861 ; the valuation of the housing and equipment from £5 to £1,840, and a total net profit of £7,717, or an average of 6*s*. 3*d*. per bird per year, has been made. Of this total profit £2,694 has been left in the business to help finance it, and £5,023 has been withdrawn. (*See* Fig. 1.)

One doubts whether it would have been possible, with any other type of stock on an area of less than 20 acres of grassland, and with an initial capital outlay of £7, to make and actually draw an average net income of £251 a year, or of £4 16*s*. 0*d*. a

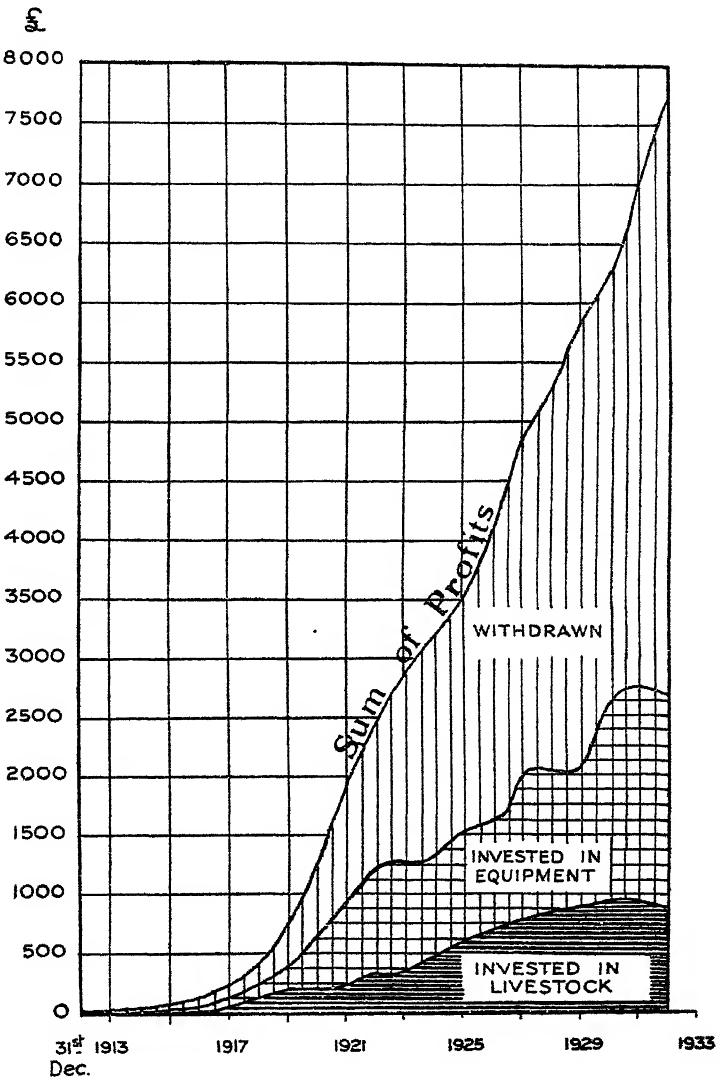

FIG. 1.—POULTRY PROFITS ON FARM A.

week, and at the same time to build up a business capable of leaving a net return of approximately £600 a year.

Relatively Safe Investment.—In spite of the fact that possibly no section of the farm has, till quite recently, received so little attention, poultry on the recorded farms have, during the ten year period, 1920–29, left an average yearly net profit of 4*s*. 6*d*. per laying bird, equivalent to 46 per cent. of the production costs. On no less than 79 per cent. of the farms have the birds more than held their own.

Our records show that during a period of acute agricultural depression there was left, in the case of poultry :—

in	1919–20	an average	surplus of	17*s*. 6*d*.	per bird
„	1920–21	„	„	14*s*. 2*d*.	„
„	1921–22	„	„	9*s*. 9*d*.	„
„	1922–23	„	„	3*s*. 0*d*.	„
„	1923–24	„	„	3*s*. 10*d*.	„
„	1924–25	„	„	4*s*. 6*d*.	„
„	1925–26	„	„	4*s*. 8*d*.	„
„	1926–27	„	„	3*s*. 8*d*.	„
„	1927–28	„	„	4*s*. 2*d*.	„
„	1928–29	„	„	5*s*. 7*d*.	„
„	1929–30	„	„	6*s*. 9*d*.	„
„	1930–31	„	„	4*s*. 11*d*.	„
„	1931–32	„	„	5*s*. 0*d*.	„
„	1932–33	„	„	3*s*. 10*d*.	„
„	1933–34	„	„	3*s*. 0*d*.	„

During a period when the farms under investigation were, on the whole, losing money, dairy cows, pigs, poultry and sheep have proved the mainstay of the industry, the cows, for instance, leaving an average net profit of approximately £7 per head per year and the poultry one of approximately 4*s*. 6*d*. per head per year ; *so that* 30 *head of poultry have, over a series of years, brought in the same net return as one cow.*

The returns from the dairy herd are determined by marketing facilities more than by any other factor ; those from pigs have been unstable ; the returns from sheep, except under very exceptional circumstances, sure but not high ; those from poultry have been well maintained at a comparatively high level, free from the general wide fluctuations of the pork trade or the local variations so characteristic of the milk industry.

Economic limit of expansion.—Throughout the country as a whole, and certainly on the farms with which we have been intimately in touch, the dairy herd is undoubtedly of greater importance than the poultry flock ; yet the economic limit of expansion is frequently reached much more quickly in the case of the former than of the latter.

In this respect the records of Farm B, one of 70 acres, in the neighbourhood of a small agricultural town in the North Riding, where markets are none too good, are interesting. Realising that on a small farm of this description quick sales and a high capital turnover were needed if the holding was to be run as an economic success, the farmer first turned his attention to milk production and, starting with eight cows, he gradually built up a retail round capable of absorbing the milk of from 13 to 14 cows. He quickly found, however, that any milk produced over and above this amount would have to be disposed of in the form of butter and cheese, fed to the stock, or put upon the wholesale market at a comparatively low figure. Realising the limitations of his milk market, the farmer next turned his attention to poultry and, while still maintaining sufficient cows to supply his retail milk round, he set himself to build up a flock of laying birds which rapidly increased from 100 to 3,000 ; beyond this figure it seemed scarcely safe for him to go since, apart from marketing problems, there were evident signs that further expansion in this direction might result in fouling his land. Still keeping his 13 dairy cows and 3,000 laying birds, he is at present engaged in expanding the pig enterprise, and has now built up, again from within, a herd of 32 breeding sows. (*See* Fig. 2.)

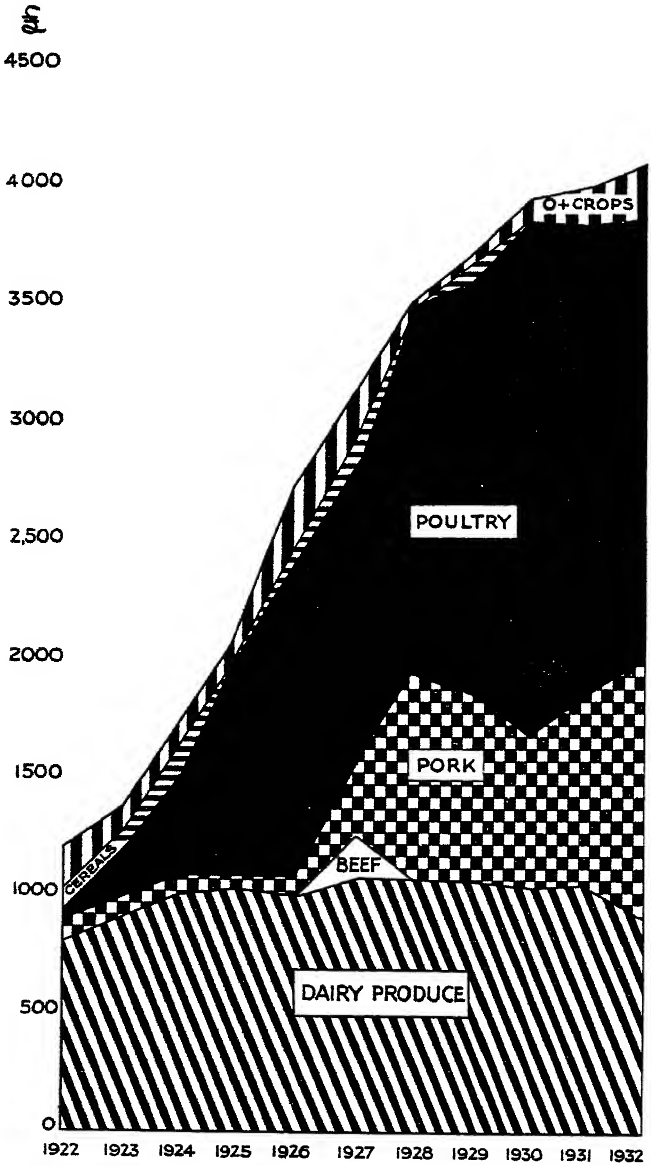

FIG. 2.—VALUE OF ANIMAL PRODUCTION, FARM B, 1922–32.

FARM B.

VARIATION IN OUTPUT OR PRODUCTION.

	1922.	1923.	1924.	1925.	1926.	1927.	1928.	1929.	1930.	1931.	1932.
	£	£	£	£	£	£	£	£	£	£	£
Milk and dairy produce . .	814	933	1,014	1,047	998	1,083	1,080	1,069	1,054	1,062	902
Beef and veal	—	2	5	17	—	192	—	—	—	—	—
Pork	85	71	60	26	87	312	875	825	654	798	1,104
Eggs and poultry . . .	75	225	449	962	1,330	1,232	1,548	1,742	2,173	1,968	1,856
Cereals	75	37	101	—	59	128	—	54	—	—	—
Other crops	170	103	122	45	276	218	39	56	87	185	264
	1,219	1,371	1,751	2,097	2,750	3,165	3,542	3,746	3,968	4,013	4,126

The profitable production of milk has been limited by the absorbing power of the local small town ; not so the production of eggs. Both milk and eggs must be sold fresh, if a market is to be built up and maintained, but eggs are still fresh a week after being laid, while milk is no longer so 24 hours after its production. Hence eggs can be, and are being, disposed of at economic prices in markets other than the purely local one.

III.—Why Poultry-Keeping has been Profitable.

That poultry-keeping should have been profitable during this period of agricultural depression would be obvious even were there no authenticated records to prove it. A study of the market returns will show that the price of eggs and poultry has been maintained at a much higher level than many of the other agricultural products.

VARIATIONS IN INDEX NUMBERS OF AGRICULTURAL PRODUCTS

	Wheat.	Eggs.	Poultry.	All Agricultural Products.
1914	107	107	95	101
1915	162	130	113	127
1916	179	159	136	160
1917	232	211	169	201
1918	223	358	257	232
1919	223	355	227	258
1920	247	339	241	292
1921	219	242	212	219
1922	146	193	192	169
1923	130	168	173	157
1924	152	168	172	161
1925	160	170	163	159
1926	164	162	159	151
1927	152	145	139	144
1928	132	146	149	147
1929	129	159	147	145
1930	79	125	148	125
1931	79	110	133	114
1932	74	107	127	106
1933	70	105	124	104

Of the total cost of upkeep of fowls about 90 per cent. can be charged to the food bill, and the relative prices of eggs and poultry have been maintained, with very few exceptions, at a level well above that of the foodstuffs commonly fed to poultry, such as wheat, oats, barley, maize, maize gluten meal, and even sharps and bran. In this respect eggs and poultry differ from most of the other farm products. The cost of growing wheat to-day is approximately 40 per cent. above the pre-war level, while its selling price is 30 per cent. below. The present low selling price of eggs is still 5 per cent. above the pre-war level, while the food bill of the poultry, unless modifications had been made in the method of feeding, would be from 15 to 20 per cent. below. (*See* Fig. 3.)

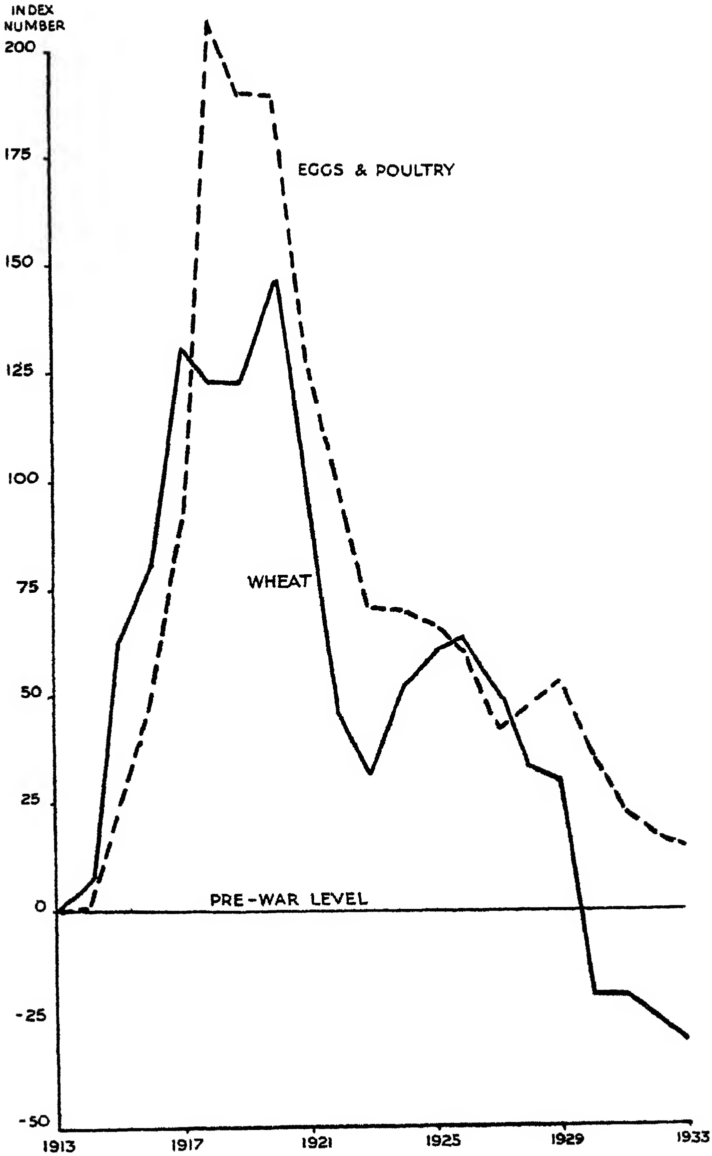

FIG. 3.—RELATIVE PRICES OF WHEAT AND OF EGGS AND POULTRY, 1913–33.

During the war, owing to the difficulty experienced in obtaining the necessary foodstuffs for poultry, the number of laying birds in the country was reduced very considerably. The 1913 returns gave the total number of fowls in the country as 29,026,000 and those of 1921 as only 24,816,000. Since then there has been a decided recovery, but it was not until 1924 that the lost ground was made good. During the war period, partly through transport difficulties and partly through the falling out of Russia, our imports of eggs fell from 2,590 million in 1913 to 318 million in 1918. With the imported supply reduced to one-eighth of the normal, the demand was bound to be in excess of the supply, with a consequent stiffening in prices. On the cessation of hostilities, when transport was again safe and tonnage available, wheat and other foodstuffs, which had been accumulating in Australia and other overseas countries, were quickly available and the abundance of supply was reflected in a rapidly falling market. But, as far as eggs are concerned, though the demand was there, neither the home nor the overseas trade could supply it, for the birds were not available. Poultry flocks can, indeed, in theory, be rapidly increased, but in actual practice housing accommodation has to be provided, and since on most farms increase in livestock, in housing and equipment must run concurrently, financial considerations put a check on expansion.

As a result of these two factors eggs remained, till 1927, the one agricultural product for which the demand in the home market exceeded both the home and imported supply, and egg producers are to be congratulated upon the fact that, just at the time when the combined home and imported supply was beginning to get slightly ahead of the demand, an improved egg marketing scheme was launched, and legislation was passed for the compulsory marking of foreign eggs. Both of these measures have given to the home-producer the practical assistance which he was beginning urgently to need.

EGG IMPORTS.

Year.	Number (Millions)	Value	Per head of Population.
1913	2,590	9,600,000	57
1914	2,119	8,650,000	48
1915	1,229	6,120,000	26
1916	793	4,740,000	17
1917	591	5,070,000	12
1918	318	4,620,000	7
1919	677	8,610,000	14
1920	847	11,570,000	18
1921	1,264	11,400,000	26
1922	1,630	12,000,000	34
1923	2,405	13,820,000	56

Egg Imports (*continued*).

Year.	Number. (Millions)	Value	Per head of Population.
1924	2,438	15,500,000	57
1925	2,624	16,600,000	61
1926	2,655	15,400,000	62
1927	2,921	15,900,000	66
1928	3,176	17,800,000	72
1929	2,996	17,900,000	68
1930	3,185	16,400,000	72
1931	3,111	14,000,000	68
1932	2,397	9,100,000	52
1933	2,205	7,305,000	48

FIG. 4.—IMPORTS OF EGGS PER HEAD OF POPULATION, 1913–33.

IV.—WHERE POULTRY ARE TO BE FOUND.

Von Thunen's Zones.—The German economist, Von Thunen, in a work called *The Isolated State*, published upwards of a century ago, endeavoured to trace the various economic factors tending to shape the farming systems of particular areas.

In order to study the part played by transport he pictured a great city set in complete isolation in the midst of a plain of which the soil was of unvarying fertility. In order to simplify the problem he supposed that no market existed for the produce of the surrounding country except in the city in question. Under these circumstances the agriculture of the surrounding area would tend to shape itself territorially into zones, arranged in a concentric manner round the city. In the vicinity of the city such products would be raised as have a great weight in proportion to their value, are very bulky, or so perishable that their production would not be feasible in more remote situations.

The innermost zone, then, would be devoted to floriculture and market garden produce ; the next to milk, with eggs just on the outermost limit. Further out would come butter, cheese, meat, pork, cereals, and finally livestock kept on open range or ranch lines, store cattle and sheep, with the latter most probably at the outmost limit. (*See* Fig. 5.)

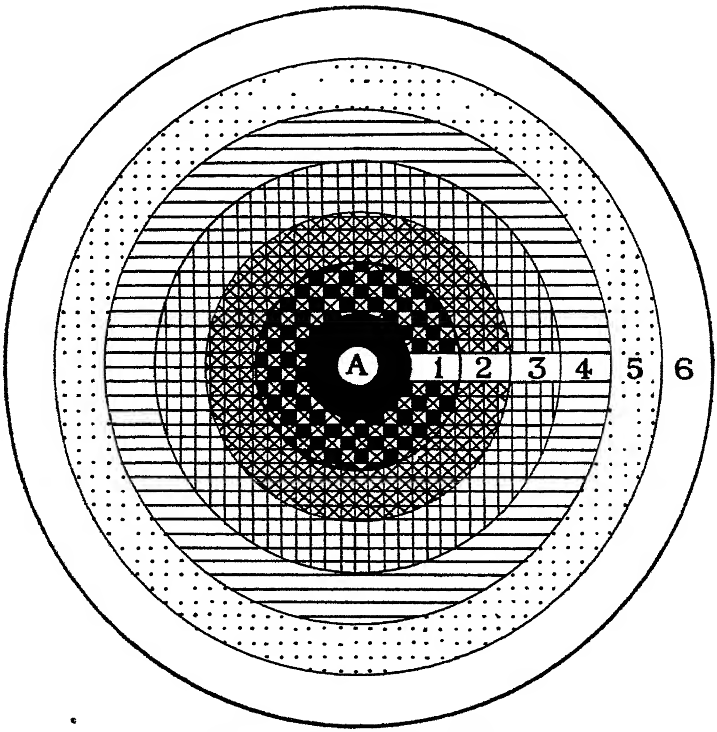

Fig. 5.—Von Thunen's Zones.

Maps of the density of poultry population in different areas show that the birds actually do tend to concentrate in the districts where, on Von Thunen's theory, one would expect to find them. In England, Scotland, and Wales, there are, as can be seen from the accompanying map (Fig. 6), nine large centres of

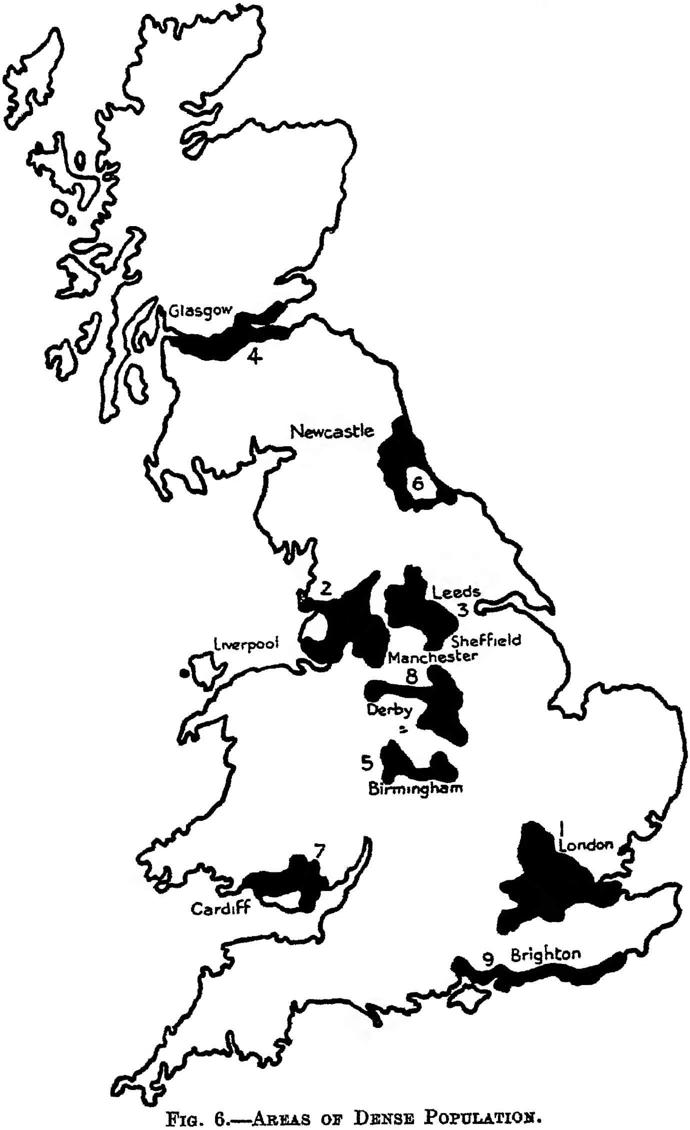

Fig. 6.—Areas of Dense Population.

population, each of which may, to a large extent, be looked upon as an isolated state in the centre of one of Von Thunen's zones.

1. The London Area.
2. The Liverpool and Manchester Area.
3. The Leeds–Sheffield Area.
4. The Glasgow Area.
5. The Birmingham Area.
6. The Newcastle Area.
7. The Cardiff Area.
8. The Derby Area.
9. The Brighton residential area on the South Coast.

The counties throughout which there is a poultry population of more than 300 per 100 acres of crops and grass are :—

(*a*) Lancashire, 1,061 birds per 100 acres,

(*b*) Cheshire, 324 birds per 100 acres,

to supply the Liverpool and Manchester area.

(*c*) The West Riding of Yorkshire, 325 birds per 100 acres, to supply the Leeds and Sheffield area.

(*d*) Essex, 310 birds per 100 acres to meet the demands of the London market.

The counties having a poultry population of from 250 to 300 birds per 100 acres are :—

(*a*) Sussex, 296 per 100 acres,

(*b*) Surrey, 296 per 100 acres,

(*c*) Kent, 278 per 100 acres.

to supply the London and Brighton areas.

(*d*) Suffolk, 255 per 100 acres, to supply the London area, development in this county being undoubtedly stimulated by the marketing facilities which have been provided since 1903 by the Framlingham and Eastern Counties Co-operative Egg and Poultry Society.

(*e*) Ayrshire, 286 per 100 acres, to supply the Glasgow area.

(*f*) Worcester, 275 per 100 acres, to supply the Birmingham area.

(*g*) Cornwall, 270 per 100 acres, is the one example in this country of a county possessing a high poultry population and yet situated in one of the outer of Von Thunen's zones. To what extent this is due to the special transport facilities for eggs, from this district, to the London market provided by the Great Western Railway and to the 14 authorised Packing Stations under the National Mark Egg Scheme in Cornwall, and the 12 similar stations in the neighbouring county of Devon, can easily be imagined.

It is also interesting to note that while improved transport facilities have made it possible for counties like Wiltshire, Dorset and Somerset, to develop rapidly their production of milk for the London market, Cornwall has been able to do the

same in the case of egg production, but has found more difficulty in the case of a more perishable commodity like liquid milk.

Anglesey, the one county in Wales which has a poultry population of over 200 per 100 acres, has again undoubtedly been helped in its marketing by the Llanfair P.G. Egg Collection Station, which dates back to 1912.

It is, too, interesting to note that the three big centres of human population which may be regarded as mainly dependent on coal-mining, namely the Newcastle, Cardiff and Derby areas, are districts in and around which the poultry population is not very dense, or in some cases definitely light—suggesting that the coal miner is not a big egg consumer. The same point can be noticed in Yorkshire, the distribution maps of which suggest a light poultry population in the newly developed Doncaster, Barnsley and South Yorkshire coal-mining areas. These facts are illustrated in Fig. 7.

Size of Holdings.—It is more than probable that the economic advantage which poultry apparently possess, and to which reference has already been made, accounts to a large extent for the relatively important part which they play on small or heavily-rented farms, where land must perforce be utilised to the fullest advantage.

The Danish figures published by Dr. Larsen, and those which we have collected in Yorkshire, show that the smaller the holding the more largely do poultry loom in the internal economy of the farm.

DANISH RECORDS.

Size of Holding.	No. of Birds per 1,000 acres.
Under 25 acres	2,940
25–50 ,,	1,320
50–75 ,,	1,220
75–100 ,,	720
100–250 ,,	390
Over 250 ,,	300

Holdings under 25 acres carry, on the acreage basis, roughly ten times as many laying birds as do those which are over 250 acres.

YORKSHIRE RECORDS, 1921–29.

Size of Holding.	Total Output per acre. £ s. d.	Output of Poultry Products per acre. £ s. d.	Poultry Products as per cent. of total.
Under 50 acres	21 8 0	2 16 0	13·2
50–100 ,,	16 14 0	1 18 0	11·3
100–150 ,,	11 16 0	1 4 0	10·2
150–300 ,,	10 4 0	12 0	5·9
Over 300 ,,	5 13 0	2 0	1·7

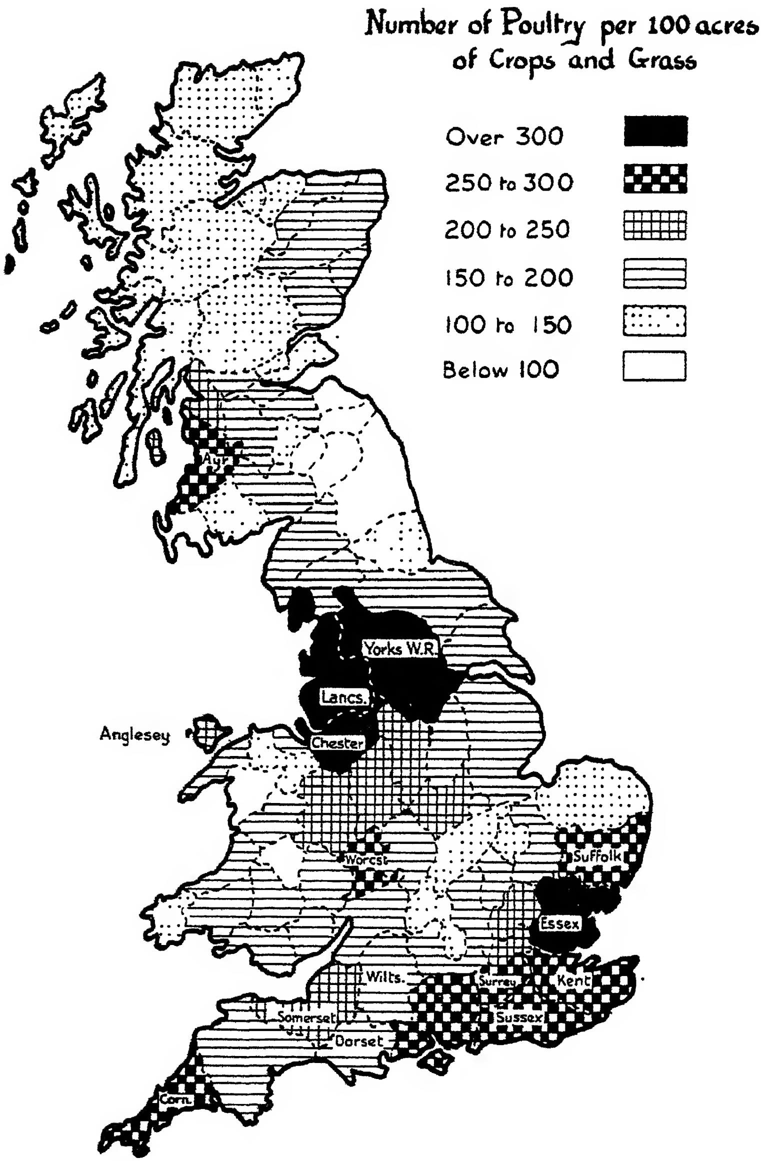

FIG. 7.—DISTRIBUTION OF POULTRY.

Thus in Yorkshire, eggs and poultry products form more than 13 per cent. of the total on holdings under 50 acres, and less than 2 per cent. of the total holdings over 300 acres.

Rentability.—

YORKSHIRE RECORDS, 1921–29.

Rent per acre.	Total Output per acre. £ s. d.	Output of Poultry Products per acre. £ s. d.	Poultry Products as per cent. of total.
Over 40*s*.	15 14 0	1 6 0	8·5
30*s*.–40*s*.	11 10 0	8 6	3·6
20*s*.–30*s*.	8 12 0	9 0	5·2
10*s*.–20*s*.	6 17 0	5 6	4·1
Under 10*s*.	1 7 0	6	1·6

Our records over a series of nine years show that poultry form 8½ per cent. of the total output on land rented at more than 40*s*. an acre, and 1½ per cent. of the total on land rented at less than 10*s*. an acre.

Poultry on a medium-sized grassland holding.—While it is on the relatively small and heavily-rented holdings, situated not too distant from the centre of one of Von Thunen's zones, that the economic value of poultry has been realised to the greatest extent, we now find them beginning to play an important part in the development of other and larger farms of lower rental value, situated in less favourable positions.

Farm C is a grass holding of 218 acres, rented at 27*s*. 4*d*. an acre, given up originally almost entirely to beef production. Of late years there has been a tendency to utilise the grassland to better advantage, making it carry more cattle and more sheep, and still further to increase the stock-carrying capacity of the holding by the keeping of pigs and of roughly a thousand head of poultry.

During the 11 years that we have been in touch with the farm it has left a total net surplus of £1,806, or an average one of just over £163 a year to meet management charges and interest on a working capital of roughly £3,000. Of this total roughly two-thirds has been left by the poultry and one-third by the pigs, while the small amount made by the sheep has approximately balanced the loss made by the cattle.

FARM C.

OUTPUT OF AGRICULTURAL PRODUCTS.

	1922–23. Total. £	1922–23. Per cent.	1929–30. Total. £	1929–30. Per cent.
Beef	1,018	92·4	806	37·0
Mutton and Wool	—	—	162	7·0
Pork	83	7·6	423	20·0
Eggs and Poultry	—	—	791	36·0
Total	1,101	100·0	21,82	100·0

As a result of reorganisation, in which poultry have played by far the most important part, the cash sales of the farm have been nearly doubled, notwithstanding the drop in agricultural prices as a whole. In 1929–30 the year's working of the farm resulted in a total net profit of £335 or one of 10·6 per cent. on the working capital. Had the farmer been trusting to cattle in the same way that he was in 1922–23 the accounts would have shown a loss of more than £200.

Poultry on a Light Arable Farm.—Farm D is one of 236 acres, of which 35 per cent. is under grass, situated on light glacial drift and alluvium, in a district not particularly favoured in regard to marketing facilities. It is an arable holding, rented at only 18*s*. an acre, none too well equipped with buildings, with very little chance of making a commercial success of liquid milk production; it has nevertheless left, during the last eleven years, an average profit of just over £722 per annum.

Looking at the annual variations in the output or production from the farm during the period that we have been closely in touch with it, the first thing that strikes one is the marked increase in the monetary value of the output of stock products, and the still more marked alteration in the type of that output.

OUTPUT OF STOCK PRODUCTS.

	1919.		1932.	
	Total. £	Per cent.	Total. £	Per cent.
Beef and Veal	657	55·4	238	16·1
Mutton and Wool	220	18·6	315	21·3
Pork	219	18·5	583	39·3
Eggs and Poultry	39	3·3	327	22·0
Dairy Produce	50	4·2	20	1·3
Total	1,185	100·0	1,483	100·0

Beef which, in 1919, formed more than 55 per cent. of the total stock products represented, thirteen years later, only 16 per cent.; while the pig and poultry enterprises are evidently now absorbing a greater share of the energies of the farm. At the present time there is a herd of 14 breeding sows and gilts, and a flock of approximately 800 laying birds, both of which have been built up largely from within.

Poultry on Milk-Producing Farms.—Poultry, too, can, and often do, form a very useful supplementary or complementary farm enterprise on many types of liquid-milk producing holdings.

(i) On Farm E a retail graded-milk round of approximately 90 gall. a day has been built up, and it has been found possible on this round to sell the eggs from 2,500 laying birds, by this means increasing the sales and output from the farm by roughly 55 per cent., while adding almost inappreciably to distribution costs.

(ii) Farm F is one of 196 acres, roughly half grass and half under the plough, situated on the Coal Measure soils just on the outskirts of the industrial area, and concentrating largely, as one would expect, on milk production. During the time that we have been in touch with it there have been few opportunities of expansion in that direction, though developments have been made with the pig and poultry enterprises, and the farm now carries, in addition to 23 dairy cows, 8 breeding sows and 1,500 laying birds. During the nine-year period an average net profit of £242 a year has been made, to which surplus the poultry have contributed no less than 36 per cent., though the holding is looked upon as essentially a milk farm, and is situated in a district where marketing facilities for liquid milk are unusually good and wholesale liquid milk prices unusually high.

FARM F.

OUTPUT OF AGRICULTURAL PRODUCTS.

	1923–24.		1932–33.	
	Total. £	Per cent.	Total. £	Per cent.
Milk and Dairy Products	731	58·0	835	38·0
Pork	27	2·0	157	9·0
Eggs and Poultry	156	13·0	776	35·0
Cereals	232	18·0	262	11·0
Potatoes	108	9·0	195	7·0
Total	1,254	100·0	2,225	100·0

Poultry on Heavy Arable Land in Holderness.—During the recent period of agricultural depression the areas which, in our own county of Yorkshire, have suffered most severely, so far as we have seen, are to be found in the East Riding, either in Holderness or on the Wolds. In both areas some 75 per cent. of the land is usually under the plough, and both suffer from the fact that perforce they must employ a large amount of sheltered labour, mainly in the production of unsheltered products.

Farm H, one of 251 acres, of which 153 are under the plough, was originally farmed on typical Holderness lines, with wheat as the main farm enterprise, while the principal types of livestock were winter-fed cattle and north-country half-bred ewes, both looked upon mainly as effective sources of fertility.

To-day, however, the original main farm enterprises—cattle, sheep and wheat—are relegated to less important positions in the internal economy of the holding, and the output from these represents only 24 per cent. of the total.

Wheat is still grown and still occupies the premier position among the arable crops, but alternative methods of disposal have been found.

Cattle and sheep are still made use of in adding to the general fertility of the holding, but there are evident signs of specialisation in other branches of stock which have, in addition, been more fruitful sources of direct revenue ; the farm now carries, in addition to 32 head of cattle and 174 breeding ewes, 8 breeding sows and more than 2,000 laying birds. It is interesting to find that the farmer is now more than holding his own, thanks largely to poultry developments, though the land is distinctly on the heavy side for poultry-keeping, and markets, apart from the assistance given by the Beverley Station, conspicuous mainly by their absence.

FARM H. OUTPUT OR PRODUCTION.

	Total £	Per Cent.
Beef and Veal	400	15
Mutton and Wool	204	7
Wheat	45	2
Eggs and Poultry	1,526	56
Pork	400	15
Dairy Produce	80	3
Potatoes	68	2
Total	2,723	100

Poultry on the Wolds.—Farm I is one of 238 acres, situated on the high Wolds. Until eight years ago it was run on typical Wold lines, with 92 per cent. of its land under the plough. To-day 198 acres are under grass which carries 320 breeding ewes, 29 breeding sows and gilts, run largely on open-air lines, and 4,500 laying birds, the housing and equipment of which have been provided almost entirely on the farm. Success in this direction has been so phenomenal that quite an extensive trade has been built up in the sale of home-made poultry appliances. It seems strange to go on to a Wold farm and see not a single head of horned stock, and not a single acre of roots for the winter folding of sheep ; yet the output from the farm is high, and the net financial returns were last year exceedingly satisfactory.

FARM I. OUTPUT OR PRODUCTION.

	Total. £	Per acre. £	s.	d.	Per Cent.
Sheep Enterprise	864	3	13	0	11
Pig Enterprise	1,120	4	10	0	15
Poultry Enterprise	5,603	23	11	0	74
Total	7,587	31	14	0	100

It will be seen that, of the three typical Wold farm enterprises—sheep, cattle, and barley—sheep now contribute only 11 per cent.

of the total and cattle and barley nothing, while poultry produce no less than 74 per cent.

Some idea of the way in which the poultry enterprise has been developed can be gathered from the details of output which last year consisted of :—

	£	*s.*	*d.*
Eggs	3,128	8	3
Day-old chicks	558	16	3
Pullets	210	6	0
Stock birds	149	11	0
Poultry for food	420	1	9
Poultry appliances	1,135	10	6
Total	5,602	13	9

It is interesting also to note that by the individual efforts of the management markets have been found, in spite of the outlying position of the holding, without having to call upon the assistance of the Beverley Egg Collection Station.

Farm J is a Wold holding of 2,615 acres, of which 440 are under grass and the remainder farmed on the Norfolk four-course rotation, the farm still being run to a large extent on normal Wold lines, though many minor modifications have been made within the limits of the system.

The main energies of the farm are still concentrated on the growing of corn, and the livestock is still valued mainly as a means of fertilising the land for the benefit of the cereal crops.

A flock of just over a thousand ewes is kept and the hoggs are still wintered on roots, but the Leicesters and Lincolns are being replaced to a large extent by half-bred and other Cheviot-cross ewes.

Instead of buying in two-and-a-half or three-year-old bullocks for heavy winter feeding in the yards, the system of breeding and rearing is being adopted. About a dozen dairy cows are kept. All the calves dropped are reared, as well as some 80 or 90 others which are bought in. Instead of aiming at getting them off fat, the bull calves are sold as strong stores, and the heifers after dropping their first or second calf, thus obviating the necessity of losses through heavy cake feeding.

A large proportion of the straw is now being converted into manure by means of pigs, which are more than holding their own. A breeding herd is being built up, and at the present time includes 57 sows and gilts. The piglets dropped are all finished, going under contract to the bacon factory at Sherburn-in-Elmet.

In addition a flock of 2,000 laying birds has been built up, again entirely from within, the eggs and cockerels being all

marketed through the neighbouring station at Beverley, of which the farmer is a director.

The output from this holding is not high on the acreage basis, representing as it does less than £5 an acre, of which that from eggs and poultry amounts now to nearly 16 per cent., but the farm is not only holding its own, but is leaving a useful margin on the right side. To this margin of profit poultry have during the last four years contributed very largely.

FARM J.

OUTPUT—YEAR ENDED 31ST DECEMBER, 1933.

	Total.	Per acre.			Per cent of total.
	£	£	s.	d.	
Wheat	3,921	1	9	11	30·5
Barley	2,805	1	1	6	21·8
Oats	676		5	2	5·3
Eggs and Poultry	2,000		15	4	15·6
Pork	1,300		9	11	10·1
Beef and Veal	1,120		8	6	8·7
Mutton and Wool	1,024		7	10	8·0
Total	12,846	4	18	2	100·0

Future Outlook for Poultry.—Since the outbreak of the war in 1914 the pathway of the poultry keeper has in a measure been strewn with roses for the greater part of the way. The concern of the present-day poultry keeper is whether the favourable conditions of the past are likely to obtain in the future. The fact that on not one of the holdings quoted are there at present any signs of preparation being made for further expansion would suggest that the future is being looked forward to with some little misgiving. If we turn to the published records we find that throughout the country there has been of late a tendency for the selling price of eggs to fall, and for the purchase price of foodstuffs to rise.

INDEX FIGURES.

	Eggs.	Poultry.	Agricultural Produce as a whole.	Purchased Foodstuffs.
October 1933	112	122	107	78
November	108	120	109	80
December	99	110	110	83
January 1934	97	115	114	82
February	95	118	112	83
March	89	126	108	85
April	99	119	111	83
May	89	129	112	82

The number of birds in the country has been more than doubled during the last ten years, and with the drop of nearly 30 per cent. in the number of eggs imported into the country since the

imposition of the 10 and 15 per cent. *ad valorem* duties in 1932 and 1933, home-produced eggs are now providing 69 per cent. of our total supplies.

At the present time we are by no means a large egg-consuming nation; and it certainly looks as though, under conditions now prevailing, the limit of expansion has been reached as far as available markets are concerned, though by no means so in the case of potential production.

Throughout the country the agricultural land is to-day carrying on the average 240 birds per 100 acres of crops and grass, as compared with :—

1,061 in Lancashire.
325 in the West Riding of Yorkshire.
324 in Cheshire.
296 in Sussex.
296 in Surrey.
278 in Kent.
275 in Worcester.
270 in Cornwall.

It would seem that one is justified in believing that the present number of birds in the country could be increased by roughly 50 per cent., if only egg production were to remain, as it has been in the past, a paying and economic proposition.

If, however, this is to be achieved, the industry will now need help, and possibly guidance. It is doubtful whether any other section of the agricultural industry could present so strong a case for practical assistance.

In the past poultry keepers, as a class, have risen to the occasion and taken full advantage of their opportunities, as is evidenced by the rapid strides that have been made along the lines both of increased technical efficiency and improved and improving marketing methods. The steady growth in the number of eggs being sold under the "National Mark", viz. :—

158·9	millions in	1930
233·8	,,	1931
312·5	,,	1932
356·3	,,	1933

is encouraging, though to-day little more than 13 per cent. of the home-produced eggs are being sold under the guarantee of that Mark. As far as the writer has been able to see, a higher standard of grading is being adopted in this country than in any other that has been visited. In South Africa the grading, when seen, was being done by hand, the total weight of the case being adjusted where necessary. In Denmark eggs are graded largely in bulk by means of the Baker Grader, while in this country, at most of the Registered Packing Stations, they are being graded individually by weight.

The growing popularity of the English egg, and particularly the English National Mark egg, is evidenced by the fact that while during the past year the average London price of National Mark Specials has fallen by roughly 2 per cent., that of Danish eggs of the same grade has fallen by 6 per cent., and of Dutch eggs by more than 9 per cent.

While one hesitates to suggest any cutting down of the present high standard of the English National Mark, particularly in the light of the success that it has achieved, and the increasing demand for the home-produced egg by the British housewife, yet one modification could now be made with advantage without, in the author's opinion, any prejudicial effect to the scheme as a whole.

An alteration in the present definition of the " Standard " egg, from one of " a minimum weight of 2 oz. " to one of " between $1\frac{7}{8}$ oz. and $2\frac{1}{4}$ oz. with a total weight of 15 lb. per long hundred ", would give the buyer a full 2-oz. average egg and would go a long way to meet the present opposition to the scheme.

The increasing mortality among birds is undoubtedly a problem urgently needing attention, and one wonders to what extent this has been caused by putting upon the birds a double strain, in trying to get them to produce a larger number of larger eggs.

The yearly variations in the death-rates of the birds at one of the Egg Laying Tests in which the writer is personally interested are well worthy of study.

Year.	Percentage Mortality.
1924–25	7·8
1925–26	9·8
1926–27	7·4
1927–28	7·61
1928–29	8·68
1929–30	12·77
1930–31	14·28
1931–32	18·21
1932–33	18·46

It will be seen that the definite break in the curve occurred in the season 1929–30, and the correlation of that break with the installation of the National Mark Scheme in February 1929 is suggestive, to say the least of it, particularly when the big increases in mortality have been to a large extent due to digestive, intestinal and ovarian troubles—all suggestive of unnatural forcing methods.

Cause of Death.	Percentage. 1924–25.	1928–29.	1929–30.	1930–31.	1931–32.	1932–33
Digestive	1·6	1·88	2·5	2·9	3·7	4·7
Intestinal and ovarian .	3·0	3·6	6·9	8·6	10·1	9·9
Tuberculosis and lung trouble	2·2	2·4	2·77	2·48	3·2	3·8
Other causes . . .	1·0	0·8	0·6	0·3	1·21	0·06
Total . .	7·8	8·78	12·77	14·28	18·21	18·46
No. of birds in test . .	603	979	1,088	1,232	1,532	1,511
Total No. of deaths . .	47	85	139	176	279	279

If any further advance or development is to be made in poultry culture one of two things must happen. First, by means of a big publicity scheme, egg consumption in this country can be increased; this is evidently the concern of the home producer, who is already doing a great deal to popularise his wares. The *per capita* egg consumption in this country, which was estimated at 160 in 1931, fell in 1933 to 152, as compared with 180 in U.S.A., 213 in Belgium, and 313 in Canada. Evidently an Egg Publicity Scheme would not be all plain sailing, for an egg, though full of meat, is still a relatively dear source of protein and energy, and by the manual worker is still looked upon largely as a luxury. As a source of protein eggs are at present prices nearly twice as expensive as new milk, and when looked at in the light of their relative "total energy values" cost roughly four times as much as milk, five times as much as bacon, six times as much as butter, and eight times as much as bread. At the present time poultry represent little more than 2 per cent. of our total meat consumption, and a big increase in the demand both for eggs and poultry may proceed, if slowly, coincident with a rising standard of living.

Unless the egg consumption in this country does increase very considerably, the only available method by means of which still further developments can be made in poultry culture is by further curtailment of imports, which could be brought about—

(*a*) by a further increase in the rate of the *ad valorem* import duty, which at the present time is certainly proving effective up to a point;

(*b*) by placing an embargo on imports, under a quota system, working possibly on the lines that are being adopted in the case of bacon, and giving to the home-producer a definite priority in the home market; arranging, in the interests of the consumer, that the total supply—home and imported—should be sufficient to meet his demands; and, in the interests of the home producer, curtailing imports as the production in this country was found to expand.

Of the 18,373,889 great hundreds of eggs coming into the country last year—

34	per cent.	came from	Denmark,
19	"	"	The Irish Free State,
10	"	"	Australia,
9	"	"	Poland,
8	"	"	China,
5	"	"	the Netherlands,

so that more than half of our imported eggs are coming from the countries which have shown recently little or no sentimental consideration in their dealings with us.

Denmark in the past, as can be seen from the summary of our international trade with her, has been quite content to send into this country practically the whole of her exportable surplus of bacon, butter and eggs, but has preferred to buy the industrial products she needs elsewhere.

Unlike the wheat and beet schemes, assistance given to the poultry industry would benefit agriculturists on every size and type of farm—the grassland farmer and his arable confrere—on light as well as heavy land ; it would, too, be help given in the home production of a commodity which can be placed in the hands of the consumer in a fresher and better condition than any imported supply.

Under the aegis of the Pig Marketing Scheme, very practical help has been given to the bacon producer, who is now assured of at least a remunerative price for his finished product, a price determined originally by his estimated production costs and varying automatically with the rise and fall of his raw materials ; he is further assured that any expansion in the enterprise in which he is interested will not result in flooding his own market or in lowering the price that he will receive, but will simply check imports from abroad, thus keeping the total supply steady and adjusted to the total demand, but giving him the assurance of priority on his own market.

With a very little judicious help this country could quickly become self-supporting as far as its egg supply is concerned, without the payment of any direct subsidy or deficiency payment ; at the same time provision could be made for an ample supply to the consumer of eggs of a quality which no imports from abroad could provide, and at a price which would be by no means prohibitive or unreasonable.

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THE CONSERVATION OF GRASSLAND HERBAGE.

THE main object in the conservation of grassland herbage is to obtain fodder for the winter feeding of stock.

The general practice has usually been to produce a bulky fodder, and to rely on concentrated foodstuffs, such as the oil-seed residues and cereals, to raise the nutrient content of the ration to the required level. This is particularly true of the dairy cow.

The chief method of conservation in the British Isles is hay-making, and it is employed almost to the exclusion of other methods. One of the disadvantages of hay-making is that at the time of year when hay is made the crop is approaching maturity, and as a result the crude protein content and the digestibility are usually relatively low. There is also a tendency to make quality subservient to quantity, by allowing the crop to come to full maturity. Hay-making in general allows little scope for anything more than the production of large amounts of fodder of relatively low feeding value, suitable only for the maintenance portion of the ration of farm stock. Some improvement in feeding value may be achieved by cutting at an earlier date than is usual, but even this will not raise the nutritive value to the level of a concentrated foodstuff.

The conservation of young leafy herbage of high analysis, on the other hand, provides a means of producing on the farm some or all of the production ration, and thus of effecting a big saving in the bill for purchased imported concentrates. The ordinary process of hay-making is, however, unsuitable for the conservation of such herbage, both on account of the high losses involved in the process, and the special necessity for fine weather to make the hay. No data were available until lately regarding the losses in nutritive value occurring during the process of hay-making under British conditions. Continental experience has shown that the losses may be very high, particularly where the hay is dried on the ground, as is usual in this country. In Northern Europe where, since the amount of concentrates fed is strictly limited, the hay crop is a most important factor in the economy of the farm, it is common practice to make use of racks, hurdles or pyramids, on or around which the fresh crop is piled to dry. The crops used on the Continent for hay-making usually contain a far higher proportion of legumes than those of our country.

The losses which occur in hay-making are due to three main causes. The cells of the freshly-cut crop are still alive, and they continue to respire or breathe until they die. This respiration involves the destruction of some of the cell con-

stituents, which are broken down and dissipated. This loss falls chiefly on the carbohydrates. After the cells are dead and the material is dry, the hay is liable to loss from exposure to rain, or even to heavy dew, which will leach out some of the soluble substances. This may be a source of serious loss, particularly if the hay is exposed to a number of showers.

The next loss is a mechanical one. When the hay, as a whole, is dry, the drier leafy portions are knocked off during the handling of the crop. Unfortunately these leafy parts, which tend to break off, are the richest in protein and also the most highly digestible. If the crop contains a large proportion of clover, the loss from this cause may be very high, and a mechanical loss of 35 per cent. of the dry matter has been recorded in Germany in the case of a pure clover hay.

In the stack there is again a further loss due to fermentation. This is evinced by the heating which is always noticeable, and which is sometimes so disastrous.

Even when the hay is cut out of the stack the losses are not finished since, apart from the loss of the fine particles in handling, the fibre in the hay calls for more energy for digestion than does the original fibre in the grass.

Wiegner[1] summarises the losses in hay-making as follows :—

TABLE 1.

LOSSES DUE TO HAY-MAKING, COMPARED WITH THE NUTRIENTS IN THE FRESH CROP.

	Dry Matter. Per cent.	Digestible Dry Matter. Per cent.	Starch Equivalent. Per cent.
Respiration	Up to 10	5–15	5–15
Mechanical losses	5–10	5–10	5–10
Fermentation in the stack	5–10	5–10	5–10
Losses due to extra energy necessary to digest the hay	—	—	10–15
Total	10–30	15–35	25–50

Other workers have obtained more favourable results, but these figures are quoted to show the kind of losses involved.

Losses in Hay-making under British Conditions.

During the last four years experiments have been carried out at Jealott's Hill to measure the losses during hay-making.

[1] *Schweizerischen Landwirtschaftlichen Monatshefte*, 1932, Vol. 10, pp. 145–170.

Two types of hay have been made in each year, ordinary hay cut at the usual time for the district—mid-June—and an early crop, cut some three to four weeks before the ordinary hay, when the grasses were just beginning to come into flower.

The experiment in 1931 was of a preliminary nature. In 1932 a random block lay-out was adopted, but this was given up in 1933 and 1934 in favour of random strips, which were found to be easier to handle in the field. Each strip or plot was weighed as fresh grass, and again as hay when led from the field, samples being taken for analysis and the determination of digestibility. The produce from each strip or plot was then loosely wrapped in open-mesh hessian, and put in different parts of a large stack. These lots were removed separately when the stack was being used, and were again weighed and sampled for analysis and for the determination of digestibility. From the data thus obtained it is possible to calculate the losses of dry matter, starch equivalent and protein equivalent.

TABLE 2.

LOSSES OF DRY MATTER, STARCH EQUIVALENT AND PROTEIN EQUIVALENT IN HAY-MAKING.

(Stated as percentages of the Fresh Grass.)

	Dry Matter.					
	In Field.	In Stack.	Total.	Starch Equivalent.	Protein Equivalent.	Weather Conditions.
1932—Early hay	20·5	5·0	25·5	45·0	44·1	Fine
Ordinary hay .	33·9	2·8	36·7	48·4	53·7	Showery
1933—Early hay	15·9	5·3	21·2	38·8	29·4	Showery
Ordinary hay .	12·3	5·1	17·4	33·1	28·7	Fine
1934—Early hay	5·4	*	*	*	*	Very fine
Ordinary hay .	9·6	*	*	*	*	Very fine

* Figures not yet available.

The figures for 1934 are necessarily incomplete, since the composition and digestibility of the hay ex-stack have not yet been determined.

These figures are striking, and show how high the losses in hay-making may be.

1933 was a good hay-making year, and 1934 exceptionally so, at Jealott's Hill. This is reflected in the lower losses of dry matter in these years. Nevertheless, the losses of starch equivalent and protein were relatively high in 1933, though they promise to be lower in 1934. The losses in 1932 (which

could not be called a bad year) are surprisingly high, and confirm the figures quoted by Wiegner for Swiss conditions. The hay was meadow hay in all cases; no figures are as yet available for "seeds" hay, where the mechanical losses may make the total somewhat higher. The losses in bad hay-making years can be imagined. The loss of protein equivalent is also serious, and of the same order as the loss of starch equivalent.

Early versus Late Cutting of Hay.

By cutting early, hay of higher nutritive value was obtained in the experiments described above. In addition there was, by the date of cutting of the ordinary hay, an aftermath fit for grazing on the plots cut for early hay. The weight of this aftermath was measured on the date the ordinary hay was cut, and the composition and digestibility of the fresh grass thus available for grazing at this date were determined.

The nutritive values of the early hay, the ordinary hay and the aftermath cuts on the early-hay plots, are summarised below :—

TABLE 3.

NUTRITIVE VALUE OF ORDINARY HAY, EARLY HAY AND AFTERMATH FRESH GRASS ON EARLY HAY PLOTS.
(Stated as percentages of the dry matter.)

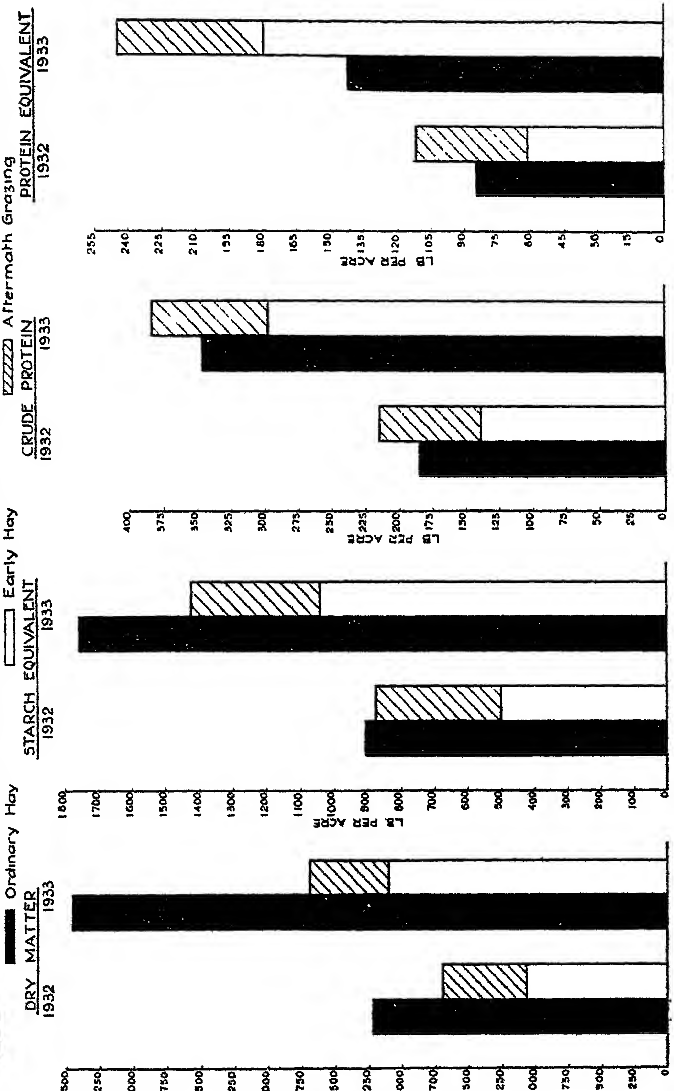
	Crude Protein.	Starch Equivalent.	Protein Equivalent.
1932—Ordinary Hay	8·3	40·8	3·8
Early Hay	12·9	47·0	5·7
Aftermath	12·4	60·0	8·1
1933—Ordinary Hay	7·9	39·9	3·2
Early Hay	14·2	49·6	8·5
Aftermath	14·7	65·2	11·1

The superiority in feeding value of the early hay and of the aftermath on the early-hay plots, over that of the ordinary hay is obvious, more particularly in the case of the protein equivalent. Some allowance has, however, to be made for the higher yield of dry matter in the ordinary hay cut. The actual yields per acre of dry matter, crude protein, starch equivalent and protein equivalent are shown diagrammatically in Fig. 1. It will be seen that the yield of hay was higher in 1933, some 2 tons of hay being obtained per acre as compared with 1 ton in 1932.

The yields of nutrients in the ordinary hay are shown as black columns, those of the early hay as plain columns. The nutrients in the aftermath grazing have been added, as shaded columns, to the early hay yields, since they should be taken into consideration when comparing the total yield of nutrients per acre.

FIGURE I

YIELD PER ACRE OF DRY MATTER, STARCH EQUIVALENT, CRUDE PROTEIN & PROTEIN EQUIVALENT IN ORDINARY HAY AND EARLY HAY, TOGETHER WITH THE AFTERMATH GRAZING



The ordinary hay produced the greater yield of dry matter per acre in both years, as compared with the early hay and aftermath. The ordinary hay also produced more starch equivalent per acre, though the difference was less marked than with the dry matter, particularly in 1932.

The crude protein and protein equivalent yields of the ordinary hay were inferior to those obtained by the other treatment.

In general, the advantage lay with the early hay and the aftermath grazing it produced. In some years, however, it is not possible to make hay in late May or early June, and it is then necesary to let the crop get more mature.

Alternative Methods of Conservation.

There are other methods of conservation applicable to grassland herbage; these have the great advantage of being independent of the weather, and hence are suitable for conserving the herbage at any stage of growth considered desirable.

Artificial Drying of Grassland Herbage.

Of these methods, artificial drying is the most attractive, since the product is portable and easily stored. Much experimental work has been carried out in recent years on artificial drying of grassland herbage, and there is every likelihood that it may soon become an economic and practical possibility. In addition to the large-scale plant, producing dried grass for sale, attention is now being focussed on the design of a farmer's plant capable of turning out about a ton of dried grass per day.

Experiments at Jealott's Hill have shown that artificial drying does not affect the digestibility of the constituents of the fresh grass. Another point which will be mentioned again later is the retention of the colour of the fresh grass. It has shown that artificial drying does not affect the most important colouring matter in the herbage—the carotene.

Examination of a large number of samples of dried grass has shown that the temperature of the drying gases has no effect on digestibility or carotene content of the product, so long as the material is not exposed to the hot gases *after it has become dry.*

This is exemplified in the following table, which gives figures for the digestibility of the crude protein and for the carotene content of typical samples of grass dried at different temperatures :—

TABLE 4.

DIGESTIBILITY OF CRUDE PROTEIN AND THE CAROTENE CONTENT OF TYPICAL SAMPLES OF GRASS DRIED AT DIFFERENT TEMPERATURES.

Temperature of Drying Gases. C°.	Digestibility of Crude Protein. Per cent.	Carotene Mgms. per 100 gms. of the Dry Matter.
80	77·8	26·8
140	76·7	30·7
250	72·8	34·5
350	78·6	—
600	81·9	39·0

The samples were not directly comparable, but the figures indicate the type of material produced in different driers. The sample dried at 600° happened to be made from lucerne cut at an early stage of growth, and thus produced a material of the highest quality. All the samples are of high digestibility and hence of high feeding value.

In an experiment at Jealott's Hill, the loss of dry matter during drying was 8 per cent., chiefly a mechanical loss due to the experimental nature of the plant. This would be reduced to a much lower, and probably negligible, amount in a drier in regular use, since the fine powdered material which was lost in the above experiment could be collected if larger amounts were present. It may be accepted that the loss of starch equivalent and protein equivalent in an efficient drier, should not exceed 5 per cent.

When a crop is dried artificially there is no time for respiration losses, nor can there be a mechanical loss due to the falling off of leafy parts in the field. Furthermore, if the material be properly dried to a low moisture content, no fermentation can take place. This latter point is of importance, and raises the question of the storage of dried grass. When it leaves the drying plant the grass may either be ground, or be baled without grinding. The former method is suitable where the material is to be used for poultry or pigs, but it has been found that in the meal form it is not suitable for other farm stock, as it is too dusty to be fed dry, and when moistened is apt to become pasty and difficult to masticate. In the unground condition it is a palatable foodstuff which is readily eaten by cattle or sheep. It can be baled with ease and then retains its fresh green colour. Tests are being carried out to study its keeping power when stored in stacks without baling.

Silage.

The alternative to artificial drying is the making of silage. This process has been practised since time immemorial, and is frequently met with in the British Isles. We shall not refer here to silage made from crops sown specially for the purpose, but restrict ourselves to silage made from grassland herbage.

Ordinary Silage.

For simplicity we may divide good ordinary silages into two classes, which may be called low-temperature and high-temperature silage respectively. In the first case the temperature attained during the process is between 80° and 100°F. (27°C.—38°C.), whilst in the second the temperature rises above 120°F. (49°C.). Control of temperature can be attained by varying the degree of compaction during the filling of the silo.

In order to understand the process of silage-making it is necessary to examine the underlying principles. When filled into the silo, or pit, the cells of the grass are still alive and, as with grass cut for hay, they continue to respire until all the available air has been used up. To reduce the losses due to respiration, it is, therefore, essential to exclude air as completely as possible, and this is the first rule in silage-making. Efficient trampling and thorough shaking out of the grass during filling are, therefore, points of extreme importance. Respiration is accompanied by the evolution of heat, and thus the temperature reached is an index of the completeness with which air has been excluded.

Control of temperature and exclusion of air are fairly simple in the silo or pit, but extremely difficult in the stack or clamp. As a result the temperature of a silage stack may, and often does, rise above 120°F. When this happens, a sweet silage is formed, and in extreme cases this assumes a dark colour, like tobacco, with a pleasant sweet smell. Though this silage is very palatable to stock and is readily eaten, the losses are extremely high, since respiration is excessive. A point of greater importance is the very marked loss of digestibility of the protein which occurs at such high temperatures. Though it seems unbelievable, some silages of this type have been found by digestibility experiments at Jealott's Hill to contain no *digestible* protein.

Another considerable loss in the stack is due to moulds penetrating the sides to a variable depth, which may extend to a foot, and is seldom less than 4 to 6 in. In a small stack the loss from this cause forms a high proportion; total losses of dry matter of up to 60 per cent. have been found in such stacks.

A container, whether it be a silo or pit, lined or unlined, considerably reduces the side loss and, with proper methods of filling, should reduce it to a negligible amount.

After the temperature has reached its maximum, and the supply of air is exhausted, the plant cells die and fermentation is started by the bacteria which are always present. In good silage the dominant fermentation is that which forms lactic acid from the carbohydrates (particularly the sugar) in the crop. The second rule in silage-making is, therefore, to stimulate lactic fermentation. The rapid formation of lactic acid raises the acidity of the mass to such a level that other undesirable fermentations are kept in subjection. Of these latter the chief is the butyric acid fermentation which gives rise to the unpleasant, persistent smell of badly-made silage, and which often gives silage a bad name. In this connection it should be mentioned that it is possible to compact silage too much, especially when the crop is wet or when it is very short and leafy. In such cases the silo should not be filled too quickly, and each

layer should be allowed to heat before the addition of the next. This is particularly important in a large tower silo, where the bottom layers may easily become too compact; the temperature and the lactic acid content do not rise sufficiently, and undesirable fermentations set in.

Accompanying the fermentation in ordinary silage there is always a breakdown of the protein to simpler nitrogenous compounds, and in extreme cases to ammonia. It is usually considered that the simpler nitrogenous compounds—often called "amides" (though this term is not strictly correct as a large proportion consists of amino-acids) are of lower feeding value than the protein from which they were formed. Modern work is tending to show that this is not correct so long as the process has not proceeded so far as to produce ammonia compounds; but this point still requires full confirmation.

To make good low-temperature silage it is essential that due care should be taken, and in general a silo, whether it be a tower silo or a simple wooden or concrete container with a moveable over-silo, is desirable. The stack or clamp should be regarded as a means of making silage from material which would otherwise be wasted, and not as a means of producing a fodder of high nutritive value.

The biggest mistake in silage-making is to assume that any sort of crop may be used with success. Bad material must make bad silage. A mature crop of half-made hay will never make silage worthy of the name. The crop designed for silage must be earmarked for that purpose as soon as the field is shut up. The best time to cut grass for silage is just before the later grasses send up their flowering heads, while the protein content is still high and the crop is still rich in soluble carbohydrates. With due attention to the underlying principles, silage can be made from still younger grass such as is often available in autumn.

The grass should be led as soon as it is cut, and should not be allowed to wilt, otherwise the exclusion of air becomes difficult. The grass is best filled-in in layers of 8 to 10 ft. at a time, allowing about 24 hours for each layer to heat up to the necessary temperature before the next layer is added. If young or wet herbage is used, the depth of the lower layers should be reduced and, if necessary, the time allowed for the rise of temperature extended.

The Addition of Molasses.

The principle involved in the addition of sugar or molasses is the addition of a soluble carbohydrate in order to speed up the formation of lactic acid. Molasses is particularly valuable with

young leafy herbage, in which the protein content is high and the soluble carbohydrates are usually relatively low.

For the purpose in view ½ to 1 lb. of sugar (or 1 to 2 lb. of molasses), suitably diluted, are added to each 100 lb. of fresh grass as filled into the silo. The silo should be filled in layers of 4 to 6 in., each of which is sprinkled with its approximate quota of the solution of sugar or molasses. All the usual precautions employed in making low-temperature silage should be taken. According to Swedish work molasses may also be used with advantage in the making of stack silage.

Addition of Mineral Acids (A.I.V. Fodder Process).

Realising that it is the acidity induced by the lactic acid which is the controlling factor in keeping down undesirable fermentation, many workers have added mineral acids to the crop. This work has culminated in the A.I.V. process originated by Professor A. I. Virtanen, of Finland. A dilute solution of mineral acids is added to the crop during the filling of the silo.

Special precautions have to be taken to ensure that the proper degree of acidity is reached. A reasonably air-proof container is essential, and the amount of acid solution added to each thin layer of grass, as it is filled in, must be at a definite rate, depending upon the crop and its moisture content.

The silo is filled as rapidly as possible, with efficient trampling of the material. A moveable over-silo is usually fitted to the silos, which are circular and of varying diameter, but with a constant height of about 6 ft. As soon as the silo and over-silo are full the whole is at once sealed off, in order to keep out the air, with a layer of soil.

When the fodder has settled into the silo (a matter of a few days) the over-silo is removed and the earth cover made good. If the silo is of wood, that part of it which is above ground level is also banked up with earth to assist in the exclusion of air.

Relative Value of Silage Processes.

Under ordinary farm conditions the losses involved in silage-making have been found at Jealott's Hill to amount, in the case of low-temperature silage, to some 15 to 20 per cent. of the dry matter. This figure includes the waste on the top of the silo, which is normally covered with a circular wooden platform and a few moveable concrete weights, no earth seal being used. The loss of starch equivalent has been about 30 per cent., and the protein equivalent has shown losses of a similar order.

Experiments are being carried out with A.I.V. fodder and with silage with added molasses; these show that the losses in the case of the A.I.V. process are lower than with ordinary

low-temperature silage, particularly in the case of the protein ; whereas the use of molasses results in losses which are of an intermediate order. Until these experiments are completed it will not be possible to quote exact figures.

The addition of molasses does not reduce the breakdown of protein which is characteristic of ordinary silage. The A.I.V. process, on the other hand, with its rapid control of fermentation in the fodder mass, reduces all fermentation to a very low level and checks the protein breakdown associated with these changes.

At Jealott's Hill all three types of silage have proved palatable to stock and have all been of high digestibility.

The Effect of Conservation on the Colour of the Product.

The most important colouring matter in grassland herbage is carotene, a yellow colouring matter which can be changed by the animal into vitamin A, the growth factor.

In hay-making the carotene of the fresh herbage is destroyed as a result of exposure to the air, and the amount in the cured hay is negligible. As has been pointed out, this colouring matter is preserved in high degree by artificial drying. It is also largely retained in low-temperature silage, with or without sugar, and to a marked extent in the A.I.V. fodder. This is clearly seen in Table 5, in which are tabulated the results obtained with some typical samples of different conservation products, though these are not directly comparable, since the same grass was not used in all cases.

TABLE 5.

CAROTENE CONTENT OF SOME GRASS PRODUCTS.

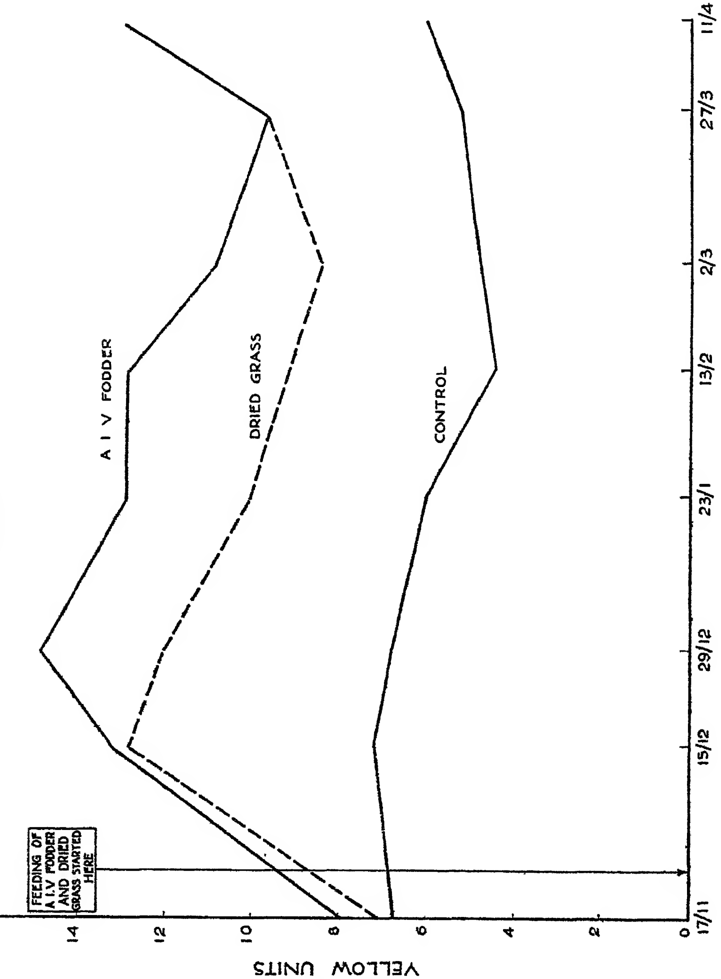
	Mgms. per 100 gms. of Dry Matter.
Artificially Dried Grass	34·5
A.I.V. Fodder	46·0
Low Temperature Silage	39·5
Meadow Hay	1·5

The quantity of carotene in the hay is negligible in comparison with the amounts in the other products, all of which show high values.

The effect of carotene in the ration is most clearly seen in the case of the dairy cow. The inclusion in the diet of a carotene-rich foodstuff results in the production of a milk with a yellow colour, the depth of tint being roughly proportional to the amount of carotene fed. This is of particular importance in winter, when the colour of the milk ordinarily becomes paler as the winter proceeds.

Fig, 2 demonstrates the effect of carotene, in the ration, on the yellow colour of butter, as found in an experiment with Shorthorn cows at Jealott's Hill in the winter of 1932–33. The control group received 20 lb. of hay per head daily, for maintenance, and concentrates were fed at the rate of 3½ lb. per gall. of milk produced, a balanced "dairy cube" being used.

FIGURE 2



The group receiving dried grass got the same maintenance ration as the control group, but half of the concentrate mixture was replaced by artificially dried grass, 4¼ lb. of the grass replac-

ing $3\frac{1}{2}$ lb. of cake. The third group received 40 lb. of A.I.V. fodder per head daily which, together with 6 lb. of oat straw, was sufficient for maintenance, concentrates being fed as for the control group. All three groups were turned out daily and had access to grass, though there was little grazing to be got. The yellow colour of the milk fell slowly from mid-November to mid-February, after which it rose slightly.

All three groups were on the same control ration in November, and the milk of all three groups was similar in colour. After changing on to their respective rations, the milk of the groups on dried grass and A.I.V. fodder rose rapidly to the level of that of early summer, and remained at a higher level throughout the period of the experiment.

The dried grass group did not reach the level of the A.I.V. fodder group, since the ration supplied less carotene per head daily. The A.I.V. fodder supplied 11 lb. of dry matter daily, containing 42·7 mgms. of carotene per 100 grams, whereas the dried grass supplied only $6\frac{3}{4}$ lb. containing 35·9 mgms. of carotene per 100 grams. Furthermore, as the lactation proceeded and the milk yield fell, the amount of concentrated food was reduced, so that the intake of dried grass also fell, whereas in the case of the A.I.V. fodder the daily intake remained constant. Thus the somewhat lower level of yellow colour for the group receiving dried grass was merely due to the fact that proportionately less dried grass was being fed. It may be taken that dried grass and A.I.V. fodder, if fed at equivalent rates, would have equal effect on the colour of the milk.

The figure shows the inferiority of the hay and concentrate ration as regards its effect on the colour of the milk. The yellow colour of milk is of importance to the dairyman ; moreover, it has been found to be proportional to the vitamin A content. Thus yellow milk is of greater value in the feeding of growing children than the usual pale-coloured winter milk. Here then is another respect in which hay-making is inferior to the other available methods of conservation.

Practical Possibilities of Fodder Conservation.

It is obvious that artificial drying and ensilage, either by the low-temperature method or with added molasses or acid, provide satisfactory methods of conserving grassland herbage. The range of material which can be conserved is wide, and herbages with crude protein contents varying from 10 to 20 per cent. of the dry matter can be conserved with equal ease. For example, the following fodders have been made at Jealott's Hill :—

TABLE 6.

NUTRIENT CONTENT OF SOME GRASS PRODUCTS.

(Stated as percentages of the dry matter.)

	Crude Protein.	Starch Equivalent.	Protein Equivalent.
Artificially Dried Grass	15·0	58·0	10·6
	21·7	58·5	15·8
Low Temperature Silage	13·7	55·5	7·7
	20·2	48·8	10·5
A.I.V. Fodder	13·9	52·0	8·3
	20·4	53·4	12·5
Meadow Hay (Av. 1932 and 1933) Ordinary	8·1	40·3	3·5
Meadow Hay (Av. 1932 and 1933) Early	13·6	48·3	7·1

The better samples of artificially dried grass, ordinary silage and A.I.V. fodder are of considerably higher nutritive value than the ordinary hay, and even the samples of lower analysis are of higher feeding value than the better samples of early hay.

It would be impracticable to obtain a hay of protein content much above that of the early hay, whilst the other three processes of conservation will allow of the production of a fodder of very high protein content.

Thirty pounds of dry matter in the form of good, average quality, artificially dried grass, A.I.V. fodder or low-temperature silage contain sufficient nutrients for the maintenance of a 12-cwt. cow and the production of 4–5 gallons of milk. With the exception of low temperature silage, all of these would then have an excess of protein. For the lower yielding cow they would provide too rich a ration, since all three are more of the nature of concentrates than roughages. In practice, therefore, it would be desirable to have two types, one low and the other rich in protein, and to use varying proportions according to the requirements of the stock being fed. By carrying this to its logical conclusion, the winter feeding of stock could be carried out almost entirely on home-produced foods.

Before a final pronouncement can be made on the relative merits of the different processes of fodder conservation, it will be necessary to obtain very complete economic data. In this regard it is not enough to know the cost, per ton, of any one of these products ; it is essential to know the cost per ton of the nutrients contained in the fodder.

It is, however, clear that, to the grassland farmer, the possibilities of improved methods of conservation are so outstanding that further work towards their practical realisation must be classed as one of the most important tasks of the investigator of the practical problems of grassland husbandry.

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NOTABLE FARMING ENTERPRISES—V.

I.—Two Decades of Light Land Farming.

In 1917 the Corn Production Act was in force and farming in the grain-growing districts of England was profitable.

In that year, William Parker, a Leicestershire grazier, and Richard Proctor, an arable farmer from the deep, rich soils of the Spalding district, hired land in the Norfolk villages of Congham and Middleton near to King's Lynn, but retained, as they do to-day, their farms in Leicestershire and Lincolnshire respectively.

From this comparatively modest beginning Messrs. Parker & Proctor's interests in Norfolk have grown to such an extent that they now farm over 14,000 acres, including 4,000 acres hired for summer grazing. Of the 10,000 arable acres, 7,500 are ploughed each year, the remainder being temporary pastures.

In seventeen years, they have added over 12,000 acres to their original hirings, the complete undertaking including twelve farms whose extremes are some thirty miles apart. At present there are 222 working horses on the farms, 29 stewards' or shepherds' ponies, 4 stallions, 938 head of commercial cattle and nearly 6,350 sheep; a pedigree herd of 55 Aberdeen-Angus cattle, 10,000 pigs, and 4,000 head of poultry complete an astonishing collection of livestock.

Such progress would seem to suggest a continuous run of success, but it would be incorrect to assume that no difficulties have been experienced in the development of what is undoubtedly one of the largest farming enterprises in England.

During the last seventeen years, Norfolk farming has experienced an agricultural depression of unprecedented severity. Messrs. Parker & Proctor's farming is, therefore, all the more interesting because it has survived, and actually increased in extent and intensity during that period.

For a time the partners farmed as Norfolk farmers, for they were too experienced to turn down summarily the practices of the farmers into whose area they had come. For eight years, until 1925 in fact, the farms were worked on the familiar Norfolk four-course rotation, the whole of the arable land being ploughed out each year—the ewe flock, the store bullock purchased for winter fattening and the horse being the only livestock interests. There was no stock-breeding. This method is undoubtedly a good way to farm light land, if condition and cleanliness of the holding are taken as the only measures of success; it is sound financially so long as corn prices and livestock prices are high enough to justify the comparatively heavy labour charges which

are involved in this not very intensive system of farming. Past generations of Norfolk farmers confidently expected to pay their wages and rent from the proceeds of the corn, *i.e.*, from half their arable acreage. The cost of living, the profit, the accumulation of reserves, or capital for the extension of activities could only arise from the remainder of the farm—from the hay and the roots. Thus much of their financial success depended upon the results of their livestock policy. "No horn no corn" was deeply embedded in their minds and they contended that light land could not be farmed without arable sheep. These and other tenets handed down by tradition were so genuinely believed that many adhered to them until financial difficulties proved too strong.

About 1922, corn prices began to fall from the high level of the war and immediate post-war period, and agricultural wages not only increased but were fixed by law. Thus a new and critical situation arose in Norfolk farming. But while corn prices fell at an alarming rate and wages became higher, the price of livestock products remained comparatively static.

It was obvious, Messrs. Parker & Proctor argued, that livestock must become increasingly important on their farms, and corn be temporarily, if not permanently, relegated to a comparatively obscure position. But to push forward a successful livestock policy implied that more land must be devoted to it, and some means found of feeding the livestock on less expensive arable crops than swedes and mangolds, which brought in no direct cash. It was decided, therefore, to grow 400 acres of sugar beet. At that time this represented a very large sugar beet contract.

This, however, did not solve the problem of corn production on land light in character and variable in yield, and confidence in the land, as arable, was lost as prices decreased. In bad times, land of that kind must carry the smallest possible commitments, and to continue to farm it wholly on the plough would not bring much relief. Here was a great problem. One of the partners already grazed magnificent pastures in the Midlands and was well versed in every detail of their management. Could the same principles be adopted in the comparatively dry county of Norfolk and (a question of even greater importance) could the light soils of West Norfolk be made to carry temporary pastures for a matter of three to five years? If they could, and if the initial fencing and watering difficulties could be overcome, these leys would be a means of adding fertility to the land without undue outlay on manures, and would increase the possibilities of the land, as arable, if and when the time should come to break up again. A more self-contained livestock policy than that adopted in typical Norfolk farming seemed to fit this system.

In other words, could the north-country temporary ley and its livestock management be imitated in Norfolk ? Could temporary pastures be made good enough to breed and feed beef animals ? Would the grassland sheep, at that time almost unheard-of in the county of Norfolk, be successful on the new pastures it was hoped to develop, and could the grassland ewe flock be run on arable land or made the means of producing hoggets to consume the beet tops on the extended area of sugar beet ? Most of these problems were solved and most of the new enterprises were successful. The installation of water, pumped by means of windmills to tanks a mile away, watered one of the least attractive parts of the arable farms ; a ram working from the Narford lake propelled water many miles and watered 4,000 acres of land. The temporary leys were at once put down. The arable flocks of sheep were sold and the shaggy-coated Mashams of mountain origin introduced in their place. Angus bulls were mated with Lincoln Red cows to breed cattle for feeding, and Hampshire rams were run with the Masham ewes. The scheme worked ; not without its difficulties, but it produced an improvement. Losses, which had become almost inevitable on the old system, were reduced, and the prospect of profit increased.

While this policy—a peculiar combination of extensive and intensive methods—was being operated, further farms were added. Norfolk farming was still in a bad way ; Norfolk landowners had extreme difficulty in keeping under cultivation the poor light lands in the neighbourhood of the Parker & Proctor farms. At least two farms were taken over by the partners which might otherwise have become derelict, unless, indeed, their owners had decided to farm them. Needless to say, under such circumstances the conditions of tenancy were not too stringent, nor were the rents too high. Cheap land, however, is more suited than dear land to extensive methods of stock raising. Messrs. Parker & Proctor realised that the labour charges under a more extensive policy on the worst land would be appreciably reduced and, if the gross return per acre did seem likely to be reduced (for at the best it could only be the value of one well-bred yearling per acre) there was actually less financial commitment, less risk and just a fair chance that the return would at least cover the outlay. In any case, it was better than the inevitable loss, at that time of about £2, on every acre of corn which was grown.

As new farms were taken over they were farmed on precisely the same lines. The beet acreage was extended and sugar beet became the only root crop. Swedes, mangolds, kales, the whole stock-in-trade of the arable sheep farmer, were ruthlessly discarded, and the sheep policy was framed around a feeding basis of beet tops and temporary pastures. The sheep and sugar beet

to a great extent held the system together, although corn prices were still falling. Barley, however, was by far the most important cereal that was grown, and although barley prices fell in sympathy with other corn prices, the price average of barley was higher than that of wheat. Prices of the first-grade malting samples remained fairly steady until 1929–30. Those districts naturally suited to barley growing therefore suffered less in favourable seasons from the general fall in corn prices. So for a time the livestock—temporary ley—barley—sugar beet policy justified itself.

Then in 1931 came the great catastrophe. The prices of all the usual products of the arable farms fell below their cost of production. Prime beef cattle were sold below 40*s.* per live cwt. Sheep prices, already lowered in 1930, fell very rapidly until they reached between 6*d.* and 7*d.* per lb. in 1932; barley was selling as low as 6*s.* per cwt. and wheat was rather worse. Wages were still high. Sugar beet prices were less, but thanks to the subsidy the crop could still be grown profitably. But another crisis had arisen. The policy of long leys which had stopped the rot for six years was receiving a searching test, and it seemed likely to fail. Livestock was no longer the sheet anchor that it had been for the past five years.

The new problem was much more difficult than the previous one. Both corn and stock were now at an unremunerative price level. Could their cost of production be reduced to a profitable basis or would it be necessary for Messrs. Parker & Proctor to give up the farms?

Sugar beet by-product feeding, and very careful purchase of concentrated foods had already reduced the cost of beef and mutton production to the lowest possible level. What were the ways of reducing the cost of cereal production? The popular answer in 1931 was by the increased use of power. After very careful consideration, Messrs. Parker & Proctor decided to use more tractors—to employ them for every possible purpose; to harvest grain by new methods; and, if possible, to absorb the labour so displaced by more intensive cultivation of the better land and by growing carrots on the inferior parts. Thus power methods and market garden crops came into the enterprise simultaneously.

All this happened shortly before Government intervention affected the price of wheat, barley and pigs, and improved the agricultural position generally despite the continued low price of sheep and beef cattle. To some extent there was now a reversal to the old order of Norfolk farming. Corn prospects looked promising; stock prospects were clouded.

So it was decided to cash some of the accumulated reserves of the temporary pastures and many of them were ploughed out,

a decision which also affected the number of cattle which could be bred. Actually, there was no reason to regret this last effect, for beef production did not pay; moreover, thanks to the Pig Marketing Scheme, the bacon pig at last seemed likely to take a profitable and important place in British farming. A herd of 1,000 Large Black and 200 Large White sows replaced some of the Angus Crosses. Temporary pastures were released from the duty of grazing bullocks.

Despite the Wheat Quota, however, the wheat acreage remained low. Two years ago, in the first flush of Quota enthusiam, 1,000 acres were grown; now there are only 220 acres. Even with the assistance of the Quota and of mechanised methods, wheat growing did not pay on the lighter soils, and the present 220 acres of wheat is confined to the best land on the farms. Messrs. Parker & Proctor's present cropping illustrates the incompatability of the wheat and beet crops, which critical persons have suggested are being combined for the purposes of exploiting Government assistance unnecessarily.

Corn growing, however, was stimulated by the Wheat Quota and by the upward trend of barley prices that followed the reduction of the beer duty in 1932, and many farmers sought means to increase their corn areas. Messrs. Parker & Proctor attacked the hay shift. Hay, in Norfolk, could only be used for stock feeding, which had become the way to ruin, not to fortune. Was it really essential to grow hay? Fattening cattle could be fed without it, and so could sheep and horses. True, all would be better with hay, but hay stacks set up and thatched with all the pride a good man can show in his work are merely monuments to locked-up capital—to an investment which yields no interest. Especially is that so when there are no dairy cows to feed.

Moreover, as a farm becomes mechanised it is a *sine qua non* that the number of horses be reduced, which is one of the minor blessings of power methods. Horses eat hay; in fact, at half a stone a day for one year each horse consumes the produce of one light-land arable acre. The 250 horses on the Parker & Proctor farms effectively prevented a cash return from 250 acres of land, which at only £8 per acre is £2,000. Would it not pay better to grow less, perhaps no hay and 250 acres more corn (in rotation, of course) and find some other food to substitute for the hay? This was the partners' argument and, being fully alive to the uses of scientific agricultural knowledge, the arable-land hay-shift was discarded, and the stock, except the horses when at work, fed without hay. Hay for horses is now obtained from permanent grass or from lucerne not quite good enough to turn into lucerne meal.

Thus at intervals during seventeen years of Norfolk farming the partners have changed their policy in an attempt to meet

altered conditions. The policy at the moment may be summarised. Every crop is a cash crop. The self-contained breeding-and-feeding livestock policy is still in operation, but temporary pastures no longer play a particularly important part in it, permanent marshland grazing being available instead. The root areas of the farm are either devoted to sugar beet, brussels sprouts, carrots or to other market garden crops. The condition of the land is maintained by sheep, usually associated with grassland, and by manure produced from horned stock and pigs—kept largely on the by-products of the root shift. There is no arable land hay.

The cropping last year was 1,200 acres of sugar beet, 893 acres of market garden crops, 70 acres of flax, 130 acres of potatoes, 2,500 acres of barley and 350 acres of wheat and oats. In addition, there are just over 2,000 acres of lucerne being grown for the manufacture of lucerne meal.

The whole is controlled by Mr. James Parker, the senior partners exercising supervisory and consultative roles. Each farm has a working farm steward who organises the labour, prepares the pay-roll and so on. Then there is a sectional expert whose responsibilities cover each block of farms; a livestock specialist, who is responsible for the welfare of the livestock on every farm, and similar men in charge respectively of the poultry, the vegetable crops, and the lucerne crop organisation. Mr. James Parker makes himself responsible for the machinery on every farm and in addition directs the whole organisation on the spot. The farm office is at Babingley Hall Farm, which is owned by H.M. the King. The stewards make weekly returns and requisitions. One clerk is employed, and a quarterly audit is held. There is a workshop on the centrally situated Gayton farm where all the repairs to implements are carried out.

Beef Production.—One of the partners is continually buying and selling stock and has contracts for fat animals to fulfil. Thus he attends markets all over England, so that a first-class market intelligence is available for the Norfolk farms and a place and purpose is fixed for every animal almost before it is born. Rarely are the Angus crosses seen at public auctions but they are serious competitors at the Norwich, Birmingham, Smithfield, Leicester and other Christmas Fat Stock Shows.

Every effort is made to turn out a uniform product from the home bred animals, and their management is constant from year to year. On such a large undertaking there is no time for unnecessary detail and the management of the cows and their calves is simple. Calving is timed to coincide with the spring growth of grass and the calf stays out in the field with its mother. Many of the cows rear two or three calves, which are run in pairs,

the foster calf being attached to the cow's calf by a leather collar and lead. The two run and suck together. The method ensures that the second calf is allowed to feed and saves the labour of a man's attention at suckling. Even when the cow dislikes the foster calf she must allow it to feed; otherwise she starves her own calf. The straps are kept on until the cow is thoroughly resigned to the second calf, which is bought in a Midland market. Lincoln Red heifer calves are reared to come into the herd in due course, and other calves are bought in the same market for ultimate beef production. The Aberdeen-Angus herd supplies the bulls required for crossing with the Lincoln cows.

As a rule, it is possible to finish the steers at 10–11 cwt. live weight, at about two and a half years old. Sometimes, but not often, it takes rather longer than 2½ years.

After the calves are weaned the stock management is not complicated. The cows are never housed and spend all their time on the grass, or grazing the beet tops after the crop has been lifted.

The calves are well housed in Norfolk bullock yards and are fed on beet pulp, a little meadow hay, and concentrates. The next summer they go out to grass, coming into the yards again for the winter, the next summer some may become fat enough to sell off the grass. If not, a further period in the yards finishes them off in prime condition. Thus sales of beef cattle are going on almost uninterruptedly throughout the year.

Here, then, is a beef enterprise which satisfies a discriminating trade without using either roots or expensive cakes. Beet pulp is substituted for roots and is altogether more convenient to use. The quantity is easier to control, the labour of feeding is reduced; the food varies but little in condition or composition, and the necessity to feed frozen or partially decomposed roots does not arise. From whatever aspect the case may be reviewed, Messrs. Parker & Proctor have had no cause to regret their decision to discard mangolds and swedes.

There are, however, persons to be found who are always prejudiced from the outset against a new venture, and beet-pulp feeding is no exception. Farmers have maintained that cattle do not "do" so quickly on beet pulp as on roots; some butchers have supported them and added that the pulp-fed cattle do not "die so well" and that the lean eats hard. Fortunately, there is published evidence[1] refuting these contentions and Mr. Parker, who controls at least six butchers' shops in a prominent Midland city, is well satisfied with the quality of pulp-fed beef.

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[1] "Bullock Feeding on Sugar Beet Tops and Pulp." S. T. Johnson, M.A. *Jnl. R.A.S.E.*, Vol. 90, 1929.

The depreciation of cows, which is an important factor in beef production on these extensive methods, depends upon their length of life, and whether it is possible to sell them to dairy farmers at the zenith of their milking powers, in which case depreciation is negligible. It is different when they are sold as cow beef, and it is more profitable to dispose, as a down calver, of any cow that looks like making a good bag. In either case, however, the Lincoln Red Cow, does not stand at a high figure in the farm valuation. Reared on cheap land, and outwintered at a low cost they are not very expensive to maintain. The breed has undoubtedly proved its worth for this purpose in West Norfolk, and although it is not as hardy as the Galloway, for example, it is hardy enough for conditions in Norfolk, where the winters are usually not severe. It should be added that the best possible conditions for winter grazing exist on light-land pastures, and Messrs. Parker & Proctor can always find a dry pasture sheltered by coniferous belts for use in inclement weather ; this may be, in no small measure, the secret of their successful outwintering.

Pigs.—During the last three years pigs have been used as straw tramplers and to fulfil a large bacon contract. The Large Black sows are crossed with Large White boars and the Large Whites are kept pure. A few Blacks are also bred pure to replenish the herd. The pig houses are situated at convenient places on the arable land, and, being constructed of straw bales, rough timber and brushwood, were erected at a very low cost. They are surrounded by a wire fence, around which straw stacks are built. Straw is thrown into the yards as required. Water is laid on to each pig yard and dry feeding is universally adopted. There are rather more than 10,000 pigs on the farms.

Sheep.—Sheep feeding, like cattle feeding, is based upon the by-products of crops grown for other purposes. Sheep are folded over the beet tops from October to February, and then go on to the residues of vegetable crops. Thereafter they graze the salt marshes and pastures. Thus some semblance of the old régime of the arable sheep has been maintained, and folding still goes on. Not a little of the success, however, is due to the capacity of the Mashams to live on crops which would have starved the old aristocrats of the sheepfold, whose fare of early rye, oats and tares, white turnips and so on, required early preparation. The position of the folded sheep becomes much stronger when it can be employed as a scavenger, eating food which would otherwise be wasted. Then it is possible, as Messrs. Parker & Proctor have shown, to retain the principle of sheep as the sheet anchor of Norfolk light-land arable farming. The virtues which prompted the selection of the Swaledale- or Scotch Blackface-Wensleydale cross, known generally as the

Masham, were its cheapness, hardiness and thriftiness. The wool is not very valuable, but the crosses with a Down breed produce very saleable small joints. Fresh batches of sheep are brought down from the North as required, the wethers are fattened out and the ewe hoggets retained for breeding. In time they are mated to a Hampshire ram, which is preferred to the local Suffolk, because the lambs by the Hampshire rams mature more quickly.

The rams are not turned in before the third of November, so that the ewes lamb in April on the grass. No concentrated food is fed to the ewes until one week before lambing. The lambs are liberally fed and are sold fat off their mothers at about 40 lb. carcase weight. Thus the down crosses do not as a rule fold the beet tops, and beet tops are not employed to fatten sheep except when it is necessary to dispose of the wethers bought with the Masham ewe hoggets.

It is the ewe flock which folds the beet tops; a grassland sheep is thus employed as an arable land sheep, and there is apparently nothing special in the management for, as the partners state, "We have been successful in treating these sheep as others, only they are hardier and do not want such heavy feeding."

Folds, however, are not set quite so close as for the arable breeds, and a big run back is always allowed; in fact, by the time the beet tops have been completely consumed the sheep have the whole field to range over. It is, however, necessary to fold closely until the Mashams become used to the tops. Then the wire netting is moved forward each day. The feet of the sheep are trimmed, and they are dipped and run through the footbath several times during the year and one round-up serves for the combined operation. Facilities exist for all the sheep to be treated in one day.

Lucerne and Lucerne Meal.—As a general rule power farming methods result in reduced manual employment and must inevitably raise doubts as to the permanent advantage to be derived from them by any rural community. While power methods may, and often do result in lower production costs, and thus enable farmers to market their crops profitably despite low prices, perhaps they are of doubtful advantage to the country if, in consequence, displaced labour has to be maintained by some form of State assistance. There are, of course, several sides to this issue; each is arguable with much force.

But it is sufficient for the present purpose to note that on most of the Norfolk power farms some attempt is being made to increase manual employment beyond the level of that of the man who farms on a rotation of fallow and two successive corn

crops, employing no stock and usually selling all his straw. Attempts to avoid this system on power farms in Norfolk have taken two forms; the one has been to introduce a cash root crop like sugar beet, or vegetable crops in the place of the fallow, and the second has been to develop subsidiary industries. In the first instance sheep may be kept, but unless the farmer is still interested in beef production no manure is produced and attempts are made to sell the straw off the farm. On Messrs. Parker & Proctor's farms the straw is not sold and they have not only maintained a very large sugar beet and vegetable acreage since adopting more power, but it was owing to their initiative that the South Acre Lucerne Drying Station, owned by British Crop Driers Limited, came to be established. It is in the midst of land so light that it blows in windy weather, especially if a flat-rolled surface is left. The South Acre and adjoining Narford Farms are now set aside for lucerne cultivation.

The Lucerne Drying Station makes 50 tons of lucerne meal per working day, requires about 200 tons of green lucerne when working at full pressure, and employs 65–70 men. The product varies a little according to the time of cutting, but is of a very pleasing colour and a much better sample than the usual imported material. The analysis of an average sample is as follows :—

Moisture	4·65
Ether Extract	2·53
Crude Protein	18·92
Crude Fibre	20·5
Soluble Carbohydrates	43·1
Total Ash	10·3
	100·00

Lucerne growing for meal production is a new industry in this country. The principles underlying the establishment of the crop are the same as when it is grown for fodder. At South Acre and Narford, however, it was desired to clean and harvest the lucerne by tractor-drawn implements. It was necessary, therefore, to drill the rows straight and sufficiently wide apart to allow inter-tillage, but not so wide that smothering effects would be lost. Eleven inches between the rows proved wide enough for the tractor row-crop cultivator to work effectively, which it does as far as possible all through the winter. Cleaning on this light land was possible during the dry winters of 1932 and 1933. It would not be safe always to rely on what may be termed winter cleaning by row-crop cultivators, but Messrs. Parker & Proctor have proved that much can be done on light land during the winter by simply harrowing several times along

and across the rows of lucerne. Actually, the row-crop cultivator can be worked just as frequently as the harrows.

It is most essential that lucerne for meal should be clean, and it may need to be hand weeded. Except in one or two isolated instances this has not yet been necessary, but perhaps weediness will be a later trouble. At the present time, after two years growth, the 2,000 acres of lucerne are remarkably clean. Messrs. Parker & Proctor hope to harvest the crop for meal for seven successive years, but provision is being made to maintain a continuous supply, in the event of rather earlier failures.

The lucerne fields must not fail the factory, and during the drying season they must produce 200 tons of green lucerne daily, otherwise the running costs of the factory are increased. Moreover, the 200 tons must be harvested uniformly over each hour of the day, for the factory works three eight-hour shifts daily. Thus the farming operations have been adapted to night as well as day work, and the deliveries are made in each hour of the day; the factory cannot wait. This is no easy matter in times of drought, the effects of which are intensified on light land.

The field methods have been made efficient and speedy. As far as possible, the lucerne was drilled in blocks of fifty acres, and one field, therefore, supplies the daily requirement of the factory—this arrangement facilitates the work of harvesting and avoids breaking into the day for moving implements from field to field. Cutting and loading form one combined operation. A combined reaper-elevator made by Messrs. Ransomes, worked from a power take-off, cuts and elevates the green lucerne laterally into an independently-drawn trailer. There is an illustration of this outfit (Fig. 1 on p. 128). Each machine is worked by one man and keeps three tractors (on rubber tyres) carting. The low trailers, holding three tons of green lucerne, are also on rubber tyres, and are loaded by one man; sometimes they must be drawn four miles to the factory. When working on the longer haulages four trailers and tractors are employed. Three eight-hour shifts are worked on the farm and the tractors are fitted with headlights.

The cultivation of lucerne for lucerne meal is still in its infancy and there will doubtless be further improvements in the machinery to handle the crop. Messrs. Parker & Proctor however, have already demonstrated that it can be completely mechanised.

But there is a much wider issue—lucerne meal is being produced at South Acre on the type of land which is only profitable to plough when farming prospects are bright: as the latter become more obscure it is the kind of land which first goes out of cultivation. At the best it becomes sheep walk carrying much less than one sheep to the acre. At the worst it is left

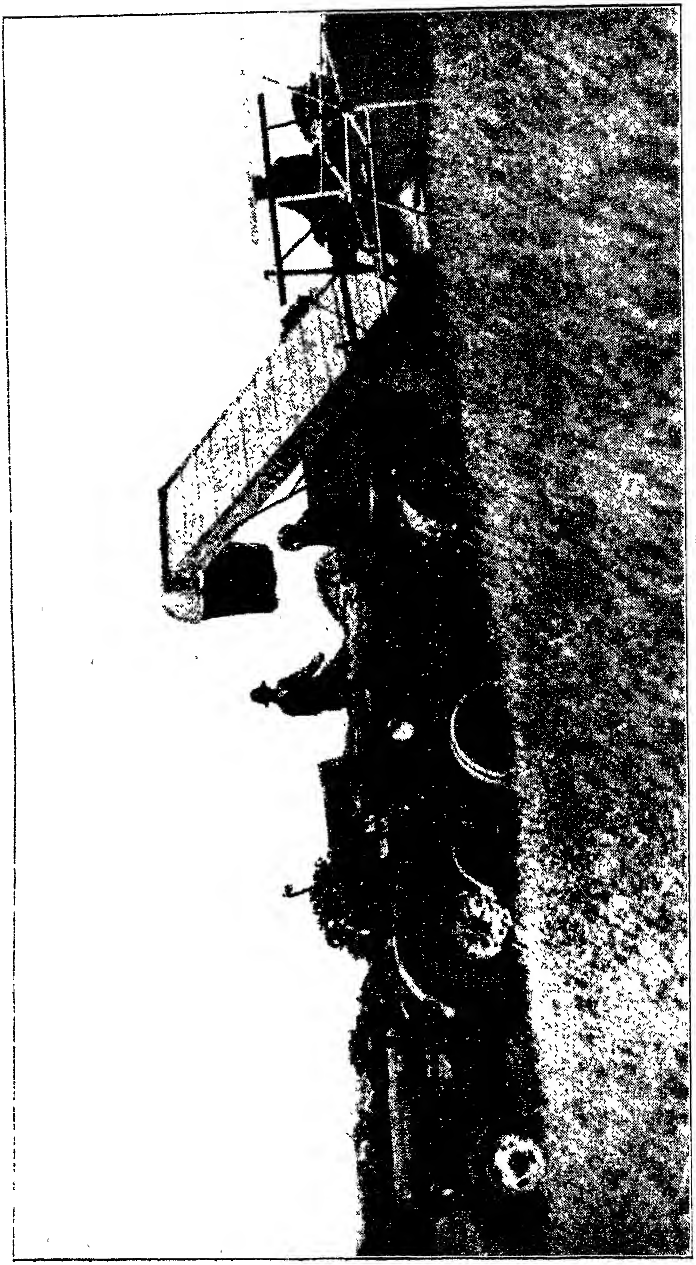

Fig. 1.—The New Reaper Elevator.
The corn is elevated loose straight from the cutting knife into the trailer. There is no tying into sheaves.

to revert to heath land. It is estimated that, on the average, about 4 tons of lucerne produces one ton of meal. If, therefore, three cuts per annum yield no more than three tons of meal the value of the processed lucerne is over £22 per acre, the price of lucerne meal at present being £7 15*s*. per ton.

There are, of course, difficulties. A factory relying solely on lucerne for its raw material can be assured of work only from May to October and the supply of lucerne from light lands may be seriously reduced in a dry time. It remains to be seen to what extent other arable crops can be grown for drying earlier and later, respectively, than lucerne. These are problems unlikely to daunt the pioneer. They foreshadow the possibility, indicated by the late T. B. Wood, of a home-grown supply of concentrated foods. Wood worked on permanent grass; Messrs. Parker & Proctor are using poor arable land to grow suitable crops and, if the factory is successful, a new branch of British light-land crop husbandry may easily arise. The produce has its competitors in the high-protein cakes, which are by-products and not a primary product like lucerne meal. Still lucerne, or any other green meal, has an advantage which the cakes do not possess. Its green colour is extremely valuable to dairy farmers for winter milk production and its vitamin- and mineral-contents are extremely good.

Power Methods.—The horses carry out the usual farm operations and are regarded as essential for manure and beet carting: the stallions are also worked throughout the year and are treated exactly the same as the other horses.

It is in the row-crop work of the vegetable and beet crops and during the harvesting of the cereals that the greatest use has been made of power. When they became interested in power farming methods Messrs. Parker & Proctor brought these new machines on to farms already well equipped with horse-drawn implements; to do that is different from stocking a new farm with power driven machinery. Then combine harvesters, driers, tractors and row-crop cultivators are not replacing partially worn-out binders, horses and horse hoes, and the farmer's capital is liquid. In the other case, much of his capital is already invested in binders and other implements, which when sold do not release much money for purchasing expensive modern machinery.

Neither, as a rule, can implements designed for horses be for long used behind tractors. Thus, while Messrs. Parker & Proctor feel that the more extensive use of power must in the end cheapen their crop production, it has entailed the provision of new capital, and they are not certain that they have derived much immediate benefit, having regard to the interest and high

depreciation charges which must be made in the early years of new machinery.

Nevertheless, with one or two exceptions, all the new machines have been retained. Some it is true have been modified. The original tractor row-crop cultivator introduced from America proved unwieldy in practice and was modified by Messrs. Ransomes with such success that it can now be driven in top gear among such crops as brussels sprouts and sugar beet, one man commonly hoeing as much as 25 acres per day. Then again high clearance tracklaying tractors have been shown to be unnecessary. These were introduced with the American row-crop equipment and while the tracklayer is the best tractor, in the opinion of the partners, for row-crop work, the standard clearance is quite sufficient for sugar beet, brussels sprouts and other vegetable crops.

It may be recorded here that Messrs. Parker & Proctor were the first English farmers to use tractor row-crop equipment on a large scale.

Their method of harvesting has also been modified. Combine harvesters are no longer used. The corn is cut and tied by binders, carted at once and threshed by a stationary machine in the field. The grain is then dried. On the farms are three driers made by British Crop Dryers, Ltd., and they have become a vital part of the harvesting equipment. In the words of Mr. W. Parker, Senr., "no farmer with 150 acres of corn should be without a drier. Then there is no stacking, no losses in the stack, no rats, no waste in the roof and in the bottom of the stack, little manual labour required for harvest, and there is no threshing in the short days of winter." Those are weighty words; they come from a senior partner of a farming concern which grows nearly 3,000 acres of corn and whose harvest takes place in as good weather as any in the British Isles. It is estimated that corn with the aid of the drier is threshed and ready for delivery two weeks earlier than is possible when the old methods are used, especially in showery weather; in good weather the advantage is not quite so great. Still, the price of corn often falls within a week or fortnight and to be able to market, as is possible with the security of the drier, almost at any time and before most persons, may be an advantage of cash value. The drier, however, loses some of its value unless backed up by adequate storage room. It might be just as disadvantageous in some years, to be forced to market immediately after harvest as it is advantageous to do so in others. On the Congham farm there is a well-designed storage barn with 12 bins to hold 200 sacks each, fed from the drier by a moving band. This, with the use of the excellent barns of the old Norfolk type, gives

adequate room for storage; much corn is sold during and immediately after harvest.

Messrs. Parker & Proctor, however, do not consider that they have reached finality in their harvesting methods and the possibility of using the lucerne reaper-elevator was investigated in the 1934 harvest. The corn was cut and loaded without difficulty and conveyed to a self-feeding threshing machine, the grain being afterwards dried. (*See* Fig. 2.) The result was encouraging: in fact, the method is preferred by Messrs. Parker & Proctor to the combine harvester, and therefore the labour organisation may be interesting. Including the men working the drying plant there are fourteen employed to harvest, thresh and dry the 20 acres it is possible to cut in a 12-hour day. There are two men working the tractor and cutter combination, two men each on the load, the threshing machine, the straw stack and the drying plant. Three drivers are required for the three loaded trailers and one man unloads at the thresher. Excluding the depreciation on the machines Messrs. Parker & Proctor calculated that the cost of harvesting, up to and including the storing of the grain, is just under 9*s*. per acre, which compares very favourably with the cost of combine harvesting for, according to Newman and Blackaby, it cost anything from 6*s*. 9*d*. to 9*s*. 6*d*. per acre in 1928 to do similar work with the combine harvester. This comparison of the two methods is only approximate, for there are practically no reliable data for estimating the depreciation of any of the new harvesting machines, and there is not necessarily any agreement in the prices charged for labour, fuel and oil. Despite these reservations it is safe to suggest that Messrs. Parker & Proctor's method is so essentially practical that it is worth investigating, especially where threshing tackle is already on the farm. The first step was to use the binders and tie the corn, convey it to a thresher of the usual type and to avoid stacking by immediate drying. The lucerne reaper-elevator, and the self-feeding drum constitute the latest modification, and will be used even more extensively next harvest.

Unlike many contemporary power farmers Messrs. Parker & Proctor regard straw as a valuable commodity, too good to be sold off the farm. The stationary thresher and the binder or reaper-elevator undoubtedly harvest more straw than the combine harvester, which not only leaves a stubble which is much too long, but breaks the straw during threshing, making it subsequently more difficult to handle. Moreover, the combine harvester leaves rows of straw in the field mixed with all the refuse of threshing, which necessitates a second operation to gather it. It is much handier, for the farmer who wants to use his straw for stock feeding or for litter, to gather it to one place

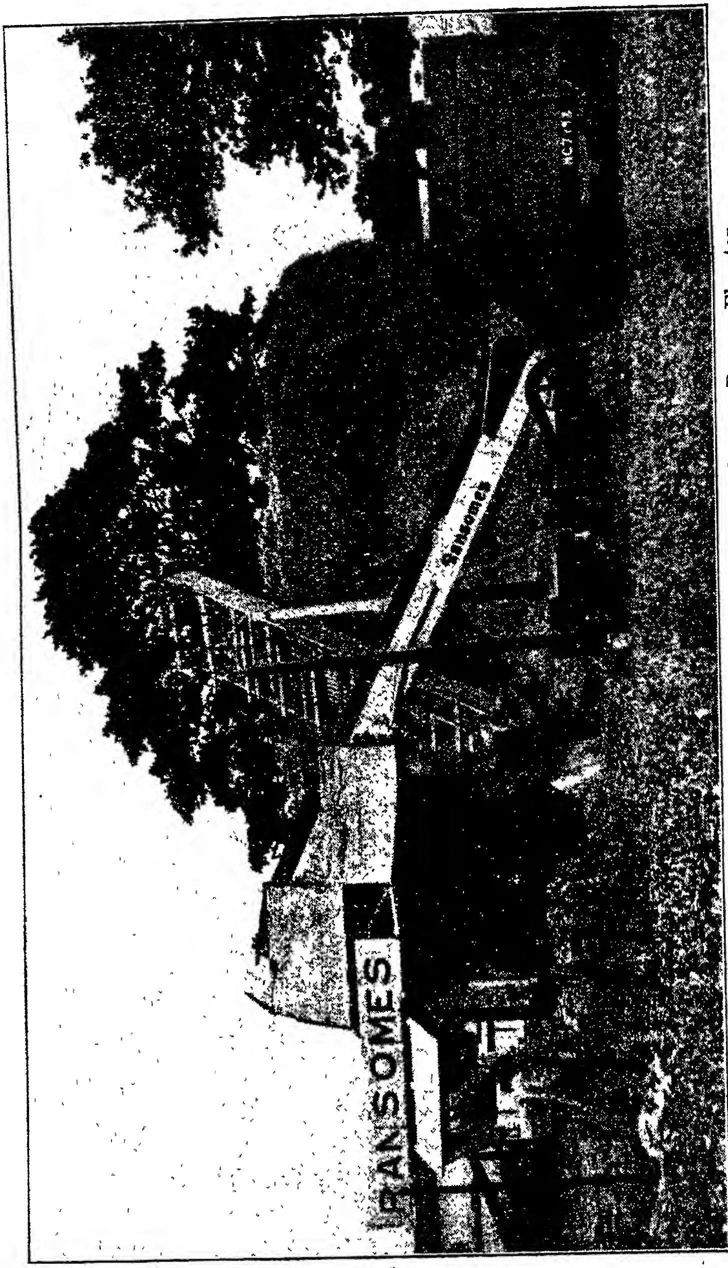

Fig. 2.—Thrashing loose corn which had been cut with the new Reaper Elevator.

in the field in one operation and to ensure that as much straw as possible is harvested.

In these respects, the old methods of harvesting and the new, but not quite so revolutionary, ones which are described above, have definite advantages. Whatever difficulties there may be in immediately stacking straw which has been cut but a few minutes before, are overcome by making the stacks long and narrow.

Light-Land Grass.—It has been said that any fool can farm good land. That perhaps explains why in this article there is little particular reference to Messrs. Parker & Proctor's methods on the best of their arable land. When miserably poor gravels overlying chalk are being made to produce good arable crops, there is food for thought. Messrs. Parker & Proctor are certain that a heavily stocked temporary ley, while stock prices were good, was an important factor in maintaining condition. At that time they were working on an attenuated four-course rotation of: beet, barley, temporary pasture for 3–5 years, barley. Sometimes two successive barley crops would be taken after the ley, but some crops were always grown which, at some stage in their growth, required sheeping or grazing with cattle. When the leys lasted only three years the rotation occupied six years, and in four of those six years the land was being manured by stock. Under those circumstances quite good crops of barley and sugar beet were grown on land rented as low as 5*s.* per acre.

The fairly successful cultivation of beet on such light land will excite no comment from those versed in its cultivation, but to attempt temporary pastures of five years' duration on very light land in one of the driest counties of England is rather more optimistic.

The partners, however, were familiar with the valuable work of those scientists who gave the lie to the old saw "to make a pasture breaks a man." They tried the simple mixtures of Cockle Park and Aberystwyth based on wild white clover, trefoil, the ryegrasses, the meadow grasses, cocksfoot, and crested dogstail. Pastures were easily established but not always easily maintained. There was usually no difficulty in maintaining excellent grass on the stiffer soils—as is generally the experience in Norfolk, despite the popular and contrary opinion—but the light soils suffered severely in dry weather, were occasionally raided by chafer larvae, and usually lost plant after the third year. New light-land pastures, however, are usually quite early and produce a surprisingly heavy yield of fodder in the early part of the year. Early pastures save winter feeding and a March feed of cocksfoot on the light-land pastures of Norfolk is often the envy of the man without them.

Messrs. Parker & Proctor always had some insurance against drought: in fact the early pastures were often made their own

insurance, for in years when they looked like growing away from the stock the most forward were shut up for hay, which was fenced off in the field to await the drought in July or August, which sooner or later was sure to burn the fields. Dry beet pulp stored in the nearest barns was, however, more frequently used.

In general, Messrs. Parker & Proctor have practised in Norfolk the Midland methods of grazing and Mr. Parker insists that whatever he can do in Leicestershire he can do in Norfolk, and claims that he can carry as much stock to the acre on land of equal calibre. He has done so on the King's estate at Babingley.

Light-Land Cultivation.—Messrs. Parker & Proctor do not hesitate to plough their light land a foot deep and frequently bring chalk to the surface, which they like not only because it helps to prevent acidity in the surface soil but because, they argue, deep ploughing helps to control the moisture. For similar reasons they do not roll their land, light as much of it is. They believe that it is possible to "roll the moisture out of the land" as a Norfolk farm labourer might remark, and there is, of course, some scientific evidence to support this opinion. But what is most astonishing is their refusal to use a roll. Few light-land farmers will agree with them: the answer is in the excellent plants of beet that are usually obtained and in the healthy appearance of the crops.

There are original features, too, in the cultivation of sugar beet. A special beet drill is used to sow the seed almost on the surface and most of the subsequent hoeing is done with the

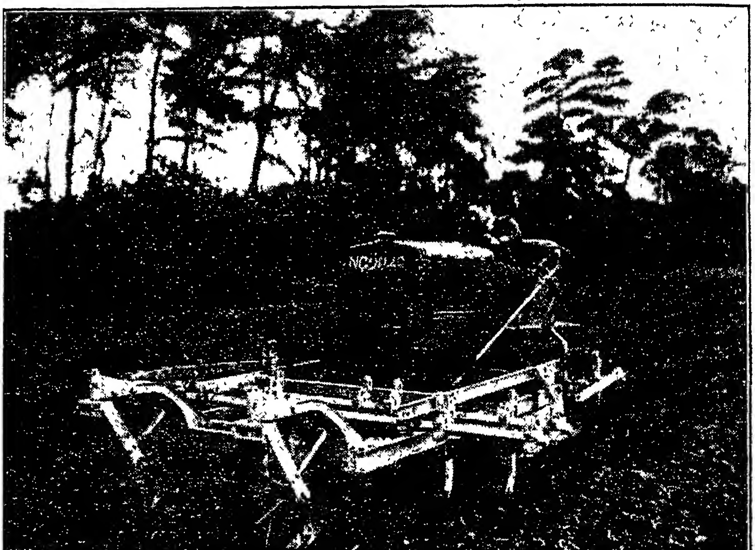

FIG. 3.—ROW-CROP CULTIVATOR.

Ransome row-crop cultivators (see Fig. 3). As often happens when implements are extensively used in crop husbandry, the crop must be made to accommodate the implement. Row widths of beet are therefore fixed by Messrs. Parker & Proctor at 21 in. so that the tractors may work with accuracy and without damage. Eight cwt. per acre of mixed artificials are used for the beet crop and the manuring generally is liberal, though not extravagant. Potash responses are very marked, and in the early days kainit used to be imported to King's Lynn in boat loads and was used at the rate of 7–10 cwt. per acre. This treatment soon prevented the lack of potash from continuing to limit yields, and the usual principles of manuring are now followed.

In writing an article in this series it is not unnatural that the reader should expect the writer to refer finally to the profit or loss of the farms. It is always difficult to do so. A true farmer never makes any profit although he continues in business. Messrs. Parker & Proctor have farmed some of the poor lands of Norfolk, with a little of the good land, for nearly two decades, and they are still in business.

F. Rayns.

Norfolk Agricultural Station,
Sprowston, Norwich.

II.—Mr. J. C. Robinson's Farms at Iford.

The charge has recently been brought forward, that little or no real progress has been or is being made in the breeding of dairy stock and that a great deal of effort is being mis-spent in the pursuit of essentially futile ideals. Such a statement is difficult to check, for precise information about early milk yields is scanty, and it is impossible to say how much of the admitted improvement is due to better feeding and management.

However this may be it is generally realised that pedigree stock-breeding is beset with difficulties and that progress, especially with the slow-breeding species, must be slow. The celebrated old Shorthorn breeder, William Torr, used to say that it took thirty years to make a herd; and since such a period covers only five or six cattle generations it leaves but little margin for the correction of mistakes. It is, therefore, only to be expected that the number of men who have left their mark upon breeds of cattle is very few. Even a man of genius must be granted long life and more than ordinary luck if he is to do so.

In the early days of breed improvement and agricultural shows men concerned themselves especially, and perhaps unduly, with type, form and fleshing qualities. That milk has

often been lost in the pursuit of such objects is unquestionably true, and the movement towards milk recording and the use of proven sires was necessary; but we must not go to the other extreme and attempt to reduce cattle breeding, as it has been put, "to a matter of book-keeping".

In this connexion it is interesting to trace the development of a herd of Dairy Shorthorns that has been in existence for nearly forty years and which has been built up on ideals that merit study and emulation. In 1895 Mr. J. C. Robinson commenced farming at Iford, near Lewes, in Sussex. Agriculture at that time was not over-flourishing, but Mr. Robinson, at 21 years of age, was given the management of a farm of 1,170 acres that had been acquired by his father. His farming training consisted of five years spent as a pupil and under-manager on a cousin's farm, with a short period on a fruit and stock farm in Kent. It was livestock breeding that became the chief interest at Iford, and the foundation of the now world-famous herd of Dairy Shorthorns was purchased at this time.

That successful breeders are always inspired by definite ideals is common knowledge. The policy pursued at Iford agreed with successful practice elsewhere. All the best breeders have been careful in selecting their foundation stock. In the early years the foundation cows for the Iford herd were purchased from breeders in Cumberland, Westmorland, Lancashire and Yorkshire. These cattle have long been regarded as the most typical dual-purpose animals within the breed and a dual-purpose ideal was set up from the beginning. Pedigree bulls of good type were used from the commencement, the first being purchased at Birmingham. Capital was not plentiful in the early years, but it is a matter of interest that this first purchase commanded the second highest price at the sale, and that Mr. Robinson was afraid to communicate the price to his father until the latter had expressed his approval of the animal. The bull was named Rowbury 75491. The purchase of Rowbury did, however, forge a link with another herd of Dairy Shorthorns that left its mark on the breed as a whole and on the Iford herd in particular.

The last few years of the nineteenth century were very critical ones for the Shorthorn breed. But for the timely intervention of a small group of far-sighted breeders it is probable that the commercial properties of the pedigree Shorthorn would have been sacrificed entirely for beef. Amongst these breeders was Mr. George Taylor who originally established a notable herd in Somerset in 1878 and who moved it to Cranford, in Middlesex, in 1891. The Cranford herd was one of the largest of its day and was developed with a view to meeting the growing demand for milk for the London market. Milk records were

kept and it was laid down that cows to be worthy of the herd should yield at least 700 gallons. Singularly enough, Mr. Taylor concentrated mainly on the best Bates strains of Shorthorns, with results that subsequently proved the wisdom of his policy. Here was a commercial breeder employing in his herd some of the strains that in the '50's, '60's and '70's had been the cause of unprecedented booms and fashions. It is sufficient to add that intelligent observers were quick to realise, in the late '90's, that the Cranford herd embodied the dual-purpose character for which, before beef began to obscure the ideals of breeders, the breed had long been famous. The Cranford herd supplied the foundation cows of many famous herds, including that maintained by the late Lord Rothschild at Tring, amongst which was Darlington Cranford 5th that averaged 10,174 lb. of milk per annum for 10 years.

Mr. Robinson quickly made contact with the Cranford herd, and it is of interest that the first Iford sire, Rowbury, went to Cranford in exchange for three bull calves. Although Rowbury was himself a good bull, he was not particularly impressive as a sire of dairy animals, but the influence of Cranford bulls that were hired or bought for the Iford herd was considerable, especially Wild Prince 15th and Wild Prince 16th. Additions were made to the herd from time to time by securing, without regard to expense, animals that represented the best families, the Bates tribes being specially favoured. At the Cranford dispersal in 1912, Mr. Robinson secured Furbelow Princess at 205 guineas, Wild Eyebright 16th at 115 guineas, Darlington Cranford 34th at 185 guineas, and Darlington Cranford 35th at 110 guineas. It has been Mr. Robinson's policy to acquire good animals periodically, and in selecting these special attention is paid to performance and breeding capacity. It is not possible to single out all the famous cows that have contributed to the establishment of this herd. The families represented in the female line include the Darlington, Barrington, Duchess, Gwynne, Kirklevington, Lady Nottingham, Waterloo, Madeline, Millicent, Laura and Nelly Lee. The Laura family is probably the most numerous in the herd. The outstanding cow of the tribe was Iford Laura 3rd (Vol. 57, p. 1118, *Coates's Herd Book*). Sired by Iford Waterloo Duke 102581, whose dam, Waterloo Aster, averaged 10,410 lb. of milk for three consecutive years, this cow proved a great breeding animal. Giving 9,269 lb. of milk with her first calf, 9,780 lb. with second calf and 10,721 lb. in the year ending October 1st, 1922, she was the dam of Iford Lawrence, sold for 900 guineas when five years old. A typical dual-purpose cow, with a wealth of frame, standing on a short leg, and with a beautiful udder, Iford Laura 3rd embodied, in Mr. Robinson's judgement, the ideal cow. She was equally popular with visitors to the

herd, and the President of the United States Dairy Shorthorn Society offered £1,500 for her. His tempting offer was refused, but he persisted in taking her yearling heifer to the United States at a cost of £700. Incidentally Iford Laura 3rd had a double cross of Waterloo blood, since her dam, Iford Laura 2nd, was by Grand Earl of Waterloo. These Waterloo cattle, in the form of Waterloo Aster, Waterloo Baroness, Waterloo Belle and Waterloo Rose, are very popular at Iford, and sires of the tribe have been very impressive.

The main object in developing the Iford herd has been the breeding of a type of Dairy Shorthorn that retains the dual-purpose qualities without any sacrifice of the milking propensities, and shows a correctly-shaped udder and well-placed teats. That this aim has been achieved is proved from an inspection of the cattle themselves as well as an examination of their milking performances. Naturally considerable significance is attached to the sires that are used. For many years past it has been the practice to see the dams and grand-dams, on both sides of the pedigree, of all sires purchased. The yielding attainments required are that the dams on both sides should be thousand-gallon cows. Mr. Robinson lays the greatest emphasis on the cattle being clean-fleshed and of real dairy character. He feels very strongly that the judging of dairy bulls at the present time is on entirely wrong lines, perhaps more especially with regard to the young bulls. He considers that the only bull classes should be for aged animals and that, in order to compensate for the reduction in the number of classes, the prizes should be increased considerably. It will thus be recognised that a high standard has been set and worked to, but it is significant that the inspection of the immediate ancestors of stock bulls has maintained the type that is associated with the best traditions of the breed. In the light of the achievements at Iford one wonders whether ordinary breeders of dairy cattle pay sufficient attention to the inspection of the immediate ancestors as a guide to the selection of suitable stock bulls. In this practice Mr. Robinson has followed in the footsteps of all successful breeders, for performance as judged by milk yield alone is not sufficiently convincing when the type of a great herd is involved. That remarkable improvements have taken place in the breeding of Dairy Shorthorns within the lifetime of the Iford herd is evidenced on all sides. It is perhaps not always appreciated by the present generation of Dairy Shorthorn breeders that the modern Dairy Shorthorn has been largely developed within the past forty years. Even in 1901 the late Professor James Long, in a letter to the *Live Stock Journal*, commented on the fact that "during the past three years some efforts have been made to encourage the milking property of the Dairy Shorthorn, but

the mere institution of a class for dairy cows at an important show will have no influence upon the establishment of the herd upon a definite basis ". Mr. Long went on to suggest that the time was ripe for considering the establishment of a herd book for dairy cattle with recorded dairy ancestry. The suggestion was resented at the time by some breeders of Shorthorns but it is of interest that the Dairy Shorthorn Association was founded in 1905 to encourage what Mr. Long had advocated four years earlier. The Iford herd has naturally profited by the popularity of the Dairy Shorthorn breed, and it has been established sufficiently long to have earned a reputation throughout the whole of the country.

In one important respect the Iford herd differs from many other well-known herds. Although some of the best animals within the breed have been bred in the herd, the exhibiting of stock at shows is avoided. This avoids many complications, but Iford-bred cattle as well as the progeny of Iford bulls have, in the hands of other breeders, enjoyed a great many show-ring successes. The main policy at Iford is commercial dairying with pedigree stock. These are the best conditions for proving the fitness of cows as the breeders of suitable sires for use in dairy herds. Most of the great herds of the present day have drawn freely on Iford-bred bulls. And what bulls some of them have been! One can mention Iford Commander 2nd 126121, whose dam gave 11,890 lb. and the sire's dam 11,744 lb. of milk in a milk-recording year. This bull was used in th Iford herd and then disposed of at Lewes Market in 1920 for £110 10*s.* when he was super-graded and was said by the butcher to kill just like a steer. His live weight was 23 cwt. 1 qr. 7 lb., the dead weight being 216 stones of 8 lb. And if the succession of bulls has been such as to command respect, the performance of individual cows has been equally remarkable. Thus Iford Charity, with nine calves in nine years, gave a total of 108,920 lb. of milk, or an average of 12,102 lb. per annum, while Iford Charity 2nd, with eight calves in eight years, gave a total of 94,181 lb. of milk, or an average of 11,772 lb. per annum.

That the breeding of Dairy Shorthorns at Iford has been successful is proved by the developments of the farming enterprise. There has indeed been a gradual widening of the acreage farmed. Thus, adjoining the Iford Farm of 1,170 acres there is now Sutton Farm of 250 acres, Rise Farms of 240 acres and Northeese of 600 acres. A small farm of 100 acres is farmed at Oaklea Warren, Newick, where Mr. Robinson lives, while Perching Sands Farm, of 340 acres, in the parish of Fulking, is rented from the Crown. Of historical interest is the fact that Mr. Robinson is also the tenant of Wm. Penn's old

farm at Warminghurst, that extends to 450 acres, while the small Newhouse farm of 70 acres adjoining is also occupied. It will thus be seen that Mr. Robinson farms as owner or tenant just over 3,200 acres. This large acreage, however, includes a considerable area of downland pasture as well as a certain amount of marsh. The soil is principally chalk, and some of the land is very fertile under the plough. In the old days much of it was identified with the Southdown breed of sheep, of which Mr. Robinson still has a registered flock of some 550 head. Of recent years he has turned his attention more to grass sheep, of the Kerry Hill, Cheviot and Welsh Mountain breeds, all of which are crossed with Southdown rams to produce fat lambs for the summer sea-coast trade. The productiveness of the land has been raised by suitable manuring; a policy of seeding down some of the arable land to grass has been followed, though there are still 400 acres under the plough at Iford. In connexion with the arable land it is of interest that the three-course rotation is still practised on these farms. This is a local Sussex custom that has been handed down from the old days. In the old days the rotation was :—

Green crop (seeds to mow and feed or green fallow for sheep).
Wheat.
Barley.

The present rotation is :—

Green crop. (Often two in one year.)
Wheat.
Oats.

On the higher-lying downland the four-course rotation is practised, but this is not the traditional one, but rather :—

Wheat.
Rape or seeds.
Oats or barley.
Rape or seeds.

Rape suits this land very well and it is used for both dairy cattle and sheep. If well-farmed it grows a heavy crop which is partially mown for the cows, with the sheep folding close behind. This makes the best possible preparation for wheat on this light land. Rape is a very cheap crop to grow, the seed costing only a few pence per acre, and no hoeing being required. Marrow-stem kale, too, is regarded as a valuable crop for the dairy cows, and shares with mangolds the ground for the provision of winter forage and roots. It was observed that in the past season, which was so troublesome because of the damage occasioned by the turnip flea beetle, seedings of rape were not subjected

to such serious fly attacks as were the seedings of marrow-stem kale. In the selection of mangold varieties reliance is placed upon those which contain the most food units per acre. A few Red Intermediates are grown for feeding in late spring. A small area of Longfellow maize is grown at Iford for soiling purposes, while cabbage also fills a minor place. Some of the arable land has been seeded down with lucerne, but it is found that this crop gives much better results and lasts longer, without suffering deterioration through weed competition, if sown along with grass seeds. A typical mixture comprises :—

$$\left.\begin{array}{ll} 21 & \text{lb. Provence lucerne} \\ 2\tfrac{1}{2} & \text{lb. Meadow fescue} \\ 2 & \text{lb. Cocksfoot} \\ 1\tfrac{1}{2} & \text{lb. Timothy} \end{array}\right\} \text{per acre.}$$

A piece of five acres has recently been ploughed out, and owing to the above grasses having been sown with the lucerne, it was difficult to find a weed in the field after five years' cropping. Trials are at present in progress to test the suitability of indigenous grasses in association with lucerne. The life of lucerne sown under these conditions exceeds 5 years. The standard of cropping and the cleanness of the ground indicate that the livestock have not been allowed to overshadow the other farming activities. Tractors are now largely used for the working of the arable land and the one-way ploughs that are used with horses indicate the character of the land.

One often thinks of a downland chalk farm as the ideal centre for the breeding and rearing of high-class healthy stock. Whether the Iford Shorthorns are healthy by nature or by reason of the naturally healthy character of the environment is not easily answered. Sufficient information will be gleaned from the fact that as long ago as 1898 regular testing of stock for tuberculosis was undertaken. The record is one that justifies the belief that tuberculin testing is well worth while, but it is equally necessary to appreciate that conditions were ideal for the success of the tuberculin-testing policy. Thus the existence of several farms made it easy to isolate reacting cattle and to allow the breeding policy to proceed without interruption. All the heifer calves go to Warminghurst farm, in West Sussex, where they are reared for a short period on tuberculin-tested nurse cows, after which they are dry reared. This farm was selected as providing a large healthy run for very little money, it being found that the young cattle keep much freer from internal parasitic troubles when lightly run over poor land, compared to heavily stocking on good land. They return at 18 months old to the high-lying and exposed downland. They run out on the downs the whole year round, without shelter other than

that provided by two sheds. They are mated to calve down at 3 to 3¼ years old. This is later than the normal, but it is explained by the fact that these cattle have an extremely rough and hard time on the Downs during winter. It will be observed that the management is such as to give every encouragement to the breeding up of a healthy race of cattle, but it is important to record the experience that, since the tuberculin-tested herds have been established, the losses ordinarily experienced in a dairy herd have been greatly diminished. This experience is not confined to the Iford herd alone, but is fairly general wherever tuberculin-tested herds have been established. Apart from the fact that milk from tuberculin-tested cows is a safer product and is likely to command a better price than ordinary milk, Mr. Robinson believes that it is financially sound to cultivate the tuberculin-test habit in the modern milking and breeding herd. There are other diseases which give rise to troubles in a milking herd apart from tuberculosis. Some twenty years ago contagious abortion gave rise to serious trouble. The use of live vaccine successfully controlled this over many years. Since, however, it has been recognised that undulant fever is caused through the milk which is given by cows affected by *B. abortus*, it has been thought desirable to obtain an abortion-free herd, by means of segregation and blood agglutination test. This work has been undertaken by Mr. McEwan, of Wye College.

The herd comprises about 200 milking cows, 100 three-year-old heifers, 100 two-year-old heifers, 100 yearling heifers and 100 heifer calves. The peak of milk production was reached in May last when 670 gallons of milk were sent away on one day. With production on this scale the finding of a market for the milk of tuberculin-tested cows (at its proper price) was not easy, so that a development of recent years was the opening of retail businesses in Norbury and later in Hove. It was because the ordinary wholesalers could not handle the quantity of Grade A (T.T.) milk produced that direct retailing was undertaken. The growth of this trade at Hove is illustrated by the comparison of the average daily sales in the last four years.

AVERAGE DAILY SALES OF T.T. MILK (HOVE)

First Week in October.	Certified Milk in pints.	Grade A (T.T.) Milk in pints.
1930	5·5	6·5
1931	46·8	372·6
1932	109·5	693·5
1933	125·3	894·2
1934 (July 4th)	162·0	1,017·3

The attainment of a steady increase in sales has been achieved by judicious advertisement of the superior virtues of raw milk produced from healthy cows under clean conditions.

A good deal of local competition had to be faced from the vendors of ordinary pasteurised milk, but the growth of this new business in Brighton and Hove proves the growing appreciation by the consuming public of the highest quality of tubercle-free milk. A certain proportion of the public prefer milk from Channel Island cattle. Hence Mr. Robinson laid the foundations of a Guernsey herd, that now numbers about 50 head, at the dispersal sale of the late Lord FitzWalter. It will thus be appreciated that, in keeping with his Shorthorn-breeding policy, the Guernsey herd was established from the soundest possible source.

The value of a continuous breeding policy over a period of forty years is considerable. The herd came near to being wrecked some seven years ago when foot-and-mouth disease appeared at the Iford farm. The whole of one milking herd was slaughtered, but as fortune would have it, the young stock and calves were on other farms, and so the continuity of the herd was preserved. The Ministry of Agriculture gave Mr. Robinson the option to nurse his herd through this illness or have them slaughtered. The slaughter policy was decided upon after receiving adequate compensation. The decision to slaughter was the right one, as many of the udders of freshly calved cows were so affected that that it was impossible to milk them.

Careful financial accounts have been kept of this farming enterprise during recent years. The record since 1920 is not particularly inspiring, largely by reason of the depreciation in the value of pedigree stock. The valuation figures covering the live and dead stock and the tenant right make interesting reading. One would feel more concerned about them if it was not for the fact that Mr. Robinson enjoyed the advantages of an appreciation in values between the period 1914 to 1920.

VALUATION OF LIVE AND DEAD STOCK AND TENANT RIGHT (MICHAELMAS ENTRY)

Year.	Total.
	£
1920	87,393
1921	65,142
1922	52,683
1923	56,552
1924	46,900
1925	45,051
1926	38,604
1927	36,429
1928	32,013
1929	31,049
1930	30,991
1931	31,352
1932	29,295
1933	30,943

The above figures include all the farms in Mr. Robinson's occupation. They indicate very plainly the shrinkage in farming capital since 1920 and bring into prominence the plight of those who started farming on borrowed capital in the boom years that followed the War.

The buildings on the Iford farms are by no means elaborate. There is, however, excellent provision for ventilation of the cowsheds. Some of the sheds are equipped with tubular fittings, but these are not in favour. A system of cowshed ventilation that has much to commend it is utilised in some of the buildings. This consists of louvre pattern ventilators in the roof, and inlet ventilators in the walls on a level with the cows' noses. The wall openings have dimensions of 8 in. × 4 in. on the outside, increasing gradually to about 14 in. × 7 in. on the inside. These rise as they come through the wall from about 1 ft. on the outside to 2 ft. on the inside, and consequently the air passes upwards. Owing to the expansion of the opening no draught is felt by cows or men milking. One ventilator serves a pair of cows. For the repair of roofs, use is being made of sheets of corrugated asbestos which are found to be cheaper than replacing the existing tile roofs. The liquid manure is collected and applied to arable land, while the washing water used in the cowsheds is diverted to a ditch, otherwise the liquid manure is so diluted it is not worth the labour of carting it out.

Mr. Robinson was the pioneer of the Grade A (T.T.) movement in the county of Sussex. In the County Clean Milk Competitions he has won and retained the 30 guinea challenge cup. Large as the herd is, hand-milking is practised, and the low bacterial counts which are the rule make Mr. Robinson well-satisfied with the existing conditions of production. Bonus payments have been utilised for maintaining the constant interest of the milkers in clean methods of production.

The feeding of the herd is on properly balanced lines. Full use has been made of the facilities provided by the County Council for advice on obscure problems through the Agricultural Organiser. Compound dairy cubes have been made up specially for East Sussex dairy farmers. From 1,500 to 2,000 tons are sold yearly, the profits being used to pay the overhead charges on the cheese factories which were established some years ago for dealing with surplus milk. Mr. Robinson is exceedingly keen to keep down all unnecessary expense in the matter of feeding, the cattle being stringently rationed. Oat straw is fed once a day. All hay, straw and roots are fed whole with the object of saving labour and expense.

It is of interest that on this large acreage practically no provision has been made for poultry keeping. It is considered risky to associate poultry with tuberculin-tested cattle. At one

time a pedigree herd of Large Black pigs was maintained, but at the present time the pig department is being re-organised and an area of downland is being used as a breeding site. There are about 100-150 Large White-Middle White cross pigs now on the farm. The farming enterprise at Iford thoroughly merits inspection, and on the main farming interest, which is the breeding of pedigree Dairy Shorthorns, one feels that here is a herd and a system of breeding that demonstrate real progress.

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FEEDING AND MANAGEMENT IN RELATION TO CARCASE QUALITY IN BACON PIGS.

In a previous volume of this Journal (Ref. 1) the different types of pig required for the bacon market and the pork market respectively have been discussed, with more particular reference to the genetic aspects of the subject. In the present paper an attempt will be made to outline briefly the effects of such environmental factors as feeding, housing and management on carcase quality in bacon pigs. For this purpose it is necessary to begin with a definition of bacon quality. In England and Wales there are two general types of cure known respectively as the " Wiltshire " and the " Midland. " In the Wiltshire method the whole side of the carcase is cured as one piece. In the Midland cure, on the other hand, certain portions of the side are removed and only a part actually reaches the public as bacon. In Scotland and Northern Ireland most of the bacon is skinned, boned and tied up in rolls before sale, but the pigmeat sold in this way does not compare in volume with that cured by the other two methods. A side of Wiltshire bacon consists of half the carcase less what are known as the secondary offals—that is the head, feet, tail, backbone, leaf fat or flare (lining the abdominal cavity), tender-loin (or fillet), aitch-bone, blade-bone and kidneys. When cured by dry salting the process takes about three weeks, while tank curing occupies only about ten days. When the sides are smoked after curing from two to three days more are required.

In the Midland cure, on the other hand, certain portions of the half-carcase are removed, not as secondary offals, but as primary products. For example the loin is taken out to be sold as fresh pork, the outer layer of fat of the heavier pigs is removed and used either for rendering into lard or for curing as fat for culinary purposes, and the leg of the pig is removed for curing separately as a ham. Particularly in the case of hams which are a product of the Midland method should it be noted that they have to undergo a long maturing process ; and this long period of maturation has a close bearing on quality because of the greater opportunity which it presents for such changes as rancidity and the development of taint. Wiltshire bacon, on the contrary, is normally consumed within three or four weeks from the time the pig is killed. Quality of bacon, therefore, will be seen to be affected partly by the conformation and " finish " of the pig and partly by the processes to which the carcase is subjected after slaughter. The latter include care in butchering, trimming, curing and smoking, and are obviously the responsibility of the curer. From the producer's point of view quality

in a bacon carcase is partly a matter of conformation and of the relative proportions of fat and lean, and partly of the texture, consistency, colour, taste and smell of the lean and fat.

With the advent of the Pigs Marketing Scheme has come payment for quality. This has been difficult to define exactly, but undoubtedly the greatest fault of most pigs in this country has been over-fatness, so that thickness of back fat has been taken as the most important criterion. In view of the importance of the middle cuts, length of side comes next in importance, and although this measurement is not at present considered in the official grading it is a factor of too great importance to be omitted here. Finally it is essential, in a Wiltshire side, that the belly should not be thin. It is true that the flank is not worth so much as the back or gammon, but the trouble is that even at its best it is a relatively thin cut, and when it is thinner than the average it yields a rasher which fries away to nothing in the pan. From another point of view thickness of streak can be considered as a good measure of "finish."

These three points, then, may be considered as officially defining quality in a Wiltshire side, which is the type of bacon imported into this country from Denmark; but certain other points which are not susceptible of measurement have to be taken into consideration. The hind quarters of the pig, commonly referred to as the hams but actually known as gammons in the Wiltshire trade, must be well developed and full of lean. The fat must be firm, white and not split off from the back. The lean must be of the correct colour, and not too hard. How do feeding and management affect quality as so defined?

Conformation.

The proportion by weight both of hams and middle must be high in comparison with the head and fore-end, because the latter is the part of the side which commands the lowest average retail price. It is true that a high proportion by weight of middle is often found in a short but fat pig, but when it is remembered that the back must not be too fat it follows that greater weight means greater length of middle. Length is a factor which has normally to be considered when discussing breed type, but there is a very important sense in which it is related to nutrition. The development both of middle and of hams normally tends to improve as the pig approaches maturity. This is because the maximum growth occurs first of all in the skeleton, secondly in the muscles and finally in the fat (Ref. 2). As there is a large amount of bone in the head and shoulders, and a greater relative proportion of muscle associated with the loin and hams, it follows that there is a kind of wave of growth from head to tail.

Up to a certain stage of maturity, therefore, conformation is improved in proportion as that stage is reached quickly. Where it is reached slowly the more rapidly growing parts—that is the fore-end—naturally have first call on the available nutrition. When the correct stage of maturity has been passed, however, no amount of extra nutrition can be made use of for the skeleton or muscles, and the surplus food is consequently employed largely for producing fat. The conformation required for bacon is one which is usually arrived at by late-maturing types at a live-weight of about 200 lb. Earlier maturing types reach approximately the same conformation at 100 to 120 lb. live-weight. It is only, however, when the pigs are on a normal plane of nutrition that maturity is reached at particular weights by particular types. A type which normally matures early will, if kept on a low plane of nutrition, reach maturity at a heavier weight than usual. The desired conformation may, therefore, be obtained either by forcing a late-maturing type to reach maturity as early as possible, or by keeping an early-maturing type in a reduced state of nutrition. To force a late-maturing type to rapid maturity it is necessary not only to feed as much food as the pig will consume, but to see that the food is properly balanced, particularly in respect of the protein and minerals which are essential for body growth. A further consideration when dealing with conformation is the effect of methods of feeding on the thickness of the streak. Thickness in this area depends partly on inheritance, but it is also to a certain extent affected by distention of the abdomen not only during the life of the pig but at the time of slaughter. Bulky slop feeding tends to weaken the streak, while dry feeding, particularly when the food is accessible all the time, appears to exert a good influence (Ref. 3). It is interesting to note that in some Danish experiments the use of very high proportions of milk had an adverse effect on quality (Ref. 4).

Fat.

The question of thickness of fat has been dealt with under conformation. The question of texture and composition are the next consideration. Soft fat is strongly objectionable for several reasons. In the first place it interferes with the appearance and firmness of the carcase, leads to difficulty in slicing and causes heavy loss in frying. In addition, however, soft fat consists of unsaturated fatty acids which tend to be oxidised to aldehydes and ketones and thus give the acrid flavour associated with rancidity (Ref. 2).

The fat in the body is, of course, made from food, but it may be produced either from actual fat ingredients (food fat) or

from carbohydrate ingredients or even occasionally from protein (Ref. 5). It has to be noted, however, that the first call appears to be on the food-fat, after which the carbohydrates are utilised and finally the protein. Body-fat made from the food-fat will be essentially of the same nature. Body-fat made from carbohydrates is always relatively hard, that is to say saturated. Now it is important to note that it happens that the food-fat in the great majority of foods given to pigs is softer, that is more unsaturated, than is required for good bacon-fat. From this it follows that if there is sufficient food-fat in the ration to produce all the body-fat, it is almost certain that this will be soft in nature. If, on the other hand, the food-fat is insufficient, then the remaining body-fat has to be synthesised from carbohydrates. Body-fat produced partly from food-fat and partly from starchy foods may be reasonably firm if the fat made from carbohydrate predominates. There are, therefore, two causes of soft body-fat. In the first case it may arise from the fact that the food-fat is so very soft that even when added to fat made from carbohydrate the resultant body-fat is less firm than required. Secondly, the proportion of the body-fat made from food-fat may be too high in proportion to what is made from starch.

It can now be understood why the fat of immature and of thriftless pigs is always softer than that of thriving and mature stock. When the pig is young the growth of both skeleton and muscles is rapid, while fat deposition is relatively small in amount. One of the typical symptoms of a thriftless pig is, of course, that it does not put on much fat. In both cases the food-fat accordingly forms a large proportion of the body-fat. In more mature stock, on the other hand, a stage is reached where much fat has to be manufactured and the proportion made from carbohydrates is, therefore, high. Anything which tends to reduce the rate of growth, such, for example, as bad weather conditions in winter, will also tend to produce soft fat.

It follows from this that at any given weight the body-fat from an early-maturing type will be firmer than that from a late-maturing type, provided the feeding is the same. Conversely the hardness of body-fat can be affected by the degree of saturation of the food fat. It has been reported by Henriques and Hansen (1899) (Ref. 6) that pigs fed on a high concentration of coconut oil showed a marked increase in firmness of the fat, with a considerably reduced iodine number. When, on the contrary, linseed oil, which is a highly unsaturated oil, was fed, the body fat was shown to be softer and less saturated.

Quality of fat may, therefore, be obtained either by using an early-maturing type of pig, or by forcing a later-maturing type.

to mature as early as possible, or by feeding only such food ingredients as have a very hard type of food-fat.

Lean.

One of the outstanding features of the changing tastes of consumers is the demand for smaller joints and leaner meat. Actually, in the case of bacon, smaller cuts are not being demanded, because this commodity is already mostly sold in the small unit of the rasher. An increasing proportion of lean is, however, certainly required. Volume of muscle has, therefore, to be obtained. It is usual to say that marbling of pig meat does not occur, as it does in beef and in mutton, but analyses have shown (Ref. 7) that even if there is little inter-muscular fat (*i.e.*, between the muscles) in a bacon carcase, intra-muscular fat (*i.e.*, within the muscles) has certainly to be reckoned with. This addition of fat to the muscle tissue not only leads to a slower penetration of salt during curing, which is an advantage, but is also responsible for less loss in weight during smoking and also in the process of dry salting. For a more detailed discussion of the effects of nutrition on fat and on curing results see Ref. 12.

As regards volume of muscle, the factors which control this are only imperfectly understood, but it may be said in general that muscular development is largely controlled by genetic constitution, though the fullest expression of this is only possible when the animal is on the most satisfactory diet. This must, of course, include plenty of protein and possibly certain mineral elements as well. In reporting experiments at Alberta, Sinclair and Sackville (Ref. 3) say that "the percentage of lean appears to be related to the nutritive ratio of the ration fed." Emmet and Grindley (Ref. 8), on the other hand, state that where two lots of four pigs each were fed on high-protein and low-protein rations, only one pig in the low-protein lot survived, and a detailed examination of its carcase showed that it was definitely thinner than those from the high-protein lot. Shaw (Ref. 9), on the other hand, in a report of a feeding trial consisting of three groups, each of six pigs, on complete, protein-deficient and calcium-deficient rations respectively, states that the pigs in the protein-deficient group gave carcases returning a lower price per score than those from the "complete" group, on account of the greater fatness of the sides. These somewhat conflicting findings have been explained (Ref. 10) as being due to difference in temperament or strain. In groups of pigs kept continuously on a protein-deficient diet, some individuals became very thin on account of the unrest induced by the deficient diet. Others did not develop this restlessness, and while their total live-weight gain was slight they became fat while still quite small.

In other experiments where higher proportions of protein were fed than were necessary to obtain maximum live-weight increase there was little, if any, evidence that the volume of lean meat was increased.

There is, however, reason to believe that large proportions of animal protein fed under suitable conditions of environment may help to develop a high proportion of lean in the carcase. During the examination at Smithfield Market of large numbers of frozen pork carcases from New Zealand pig-recording societies, it has been possible to obtain many records of the " eye of lean " in the loin and of the back fat. In general, the average proportion of lean to fat has been much higher in these carcases than in most of those entered in carcase competitions in this country. For example, Hammond (Ref. 11) points out that at the Smithfield Club's Show in 1932 the " eye of lean " from the best carcase in the 70–100 lb. (live-weight) class measured only 34 mm. across, whereas the average measurement in the case of the New Zealand pigs of similar weights has been about 40 mm.

Owing to local conditions the rations in New Zealand are extraordinarily high in protein. In many cases pigs on fresh pasture get little else than separated milk and meat meal from slaughter houses. In a typical case a group of pigs, averaging 100 lb. live-weight at slaughter, received from birth to slaughter 212 gall. of separated milk, 37 lb. of meat meal, and 23 lb. of pollard per head.

Whether the very fine results obtained are due to the better commercial type of pig selected under overseas conditions, or whether the protein diet is responsible, it would be difficult to determine without further careful investigation. The very high protein nature of the feeding is, however, suggestive and is a point which must be followed up in this country with a view to improving quality of carcase.

Marbling of the lean is an indication of " finish ", that somewhat elusive but necessary condition of quality. It is a difficult thing to achieve without increasing the thickness of the back-fat beyond the danger limit. The indications are that this again is a case where a slow-maturing type should be forced by high feeding to earlier maturity.

It is sometimes claimed that exercise leads to an increased development of the muscular tissue forming the " lean " of the carcase, but there is no evidence to this effect. Indirectly it may increase appetite and thus lead to higher food supplies being available. This in turn increases the rate of maturity and may lead to an earlier development of muscle. The process is, however, essentially one of increased nutrition. Exercise, by keeping down fat deposition, will, of course, increase the portion of lean to fat but this is different from actually

increasing the size of the muscles. Evidence that exercise increases the length of the side is also lacking.

Conclusion.

There is a tendency to consider that quality of carcase may be largely controlled by individual feeding stuffs or systems of management and it has accordingly been thought wise to deal with the whole subject here in such a way as to indicate rather the general principles involved. In some respects, however, the general factors involved may so react with one another as to give negative results. It is accordingly necessary to weigh up some of the possibilities.

To begin with we have been discussing the factors which affect quality, and the first thing to consider is whether carcase quality is actually a profitable consideration from the producer's point of view. Before the advent of the Pigs Marketing Scheme the answer to this question was generally considered to be in the negative, because the absence of payment on a quality basis made it more profitable to produce the short, fat pig which was unsuitable for bacon, but which could be produced more cheaply than the proper bacon type. With the inauguration of payment for quality the problem becomes more complicated. When prices of feeding stuffs were 7*s.* 6*d.* per cwt. the bonus of about 1*s.* per score (which a good bacon type pig would probably make over a poorer quality but more rapidly growing type) would pay for about 16 days' extra feeding. Under good management and selection of stock the bacon type should not require as much extra time as this, but when feeding stuffs rise in price and the bonus remains constant the saving on the bonus would not pay for so many days' feeding, and it is possible that it might be more profitable not to go for top quality.

A further problem may arise if the attempt is made to increase the firmness of the body-fat by feeding materials in which the fat is of a highly saturated type. For example, if a lot of pigs were making satisfactory live-weight gains on an ordinary ration—like 65 per cent. barley meal, 25 per cent. middlings and 10 per cent. fish meal—a change to a mixture containing a high proportion of some unpalatable ingredient like coconut cake might easily have the effect of putting the pigs off their feed. The general thriftlessness resulting might be sufficient to counteract the fat-hardening effect of the coconut oil.

Finally consider the general level of nutrition. In so far as conformation is concerned this is improved by high feeding only if the pig is of a late-maturing type. In the case both of fat and lean, however, all the evidence suggests that a high level of nutrition gives the better results. To keep an early-maturing type on a low plane of nutrition is not likely to give such good

results either as regards lean or fat, though a satisfactory general conformation may be produced. Where quality only is considered, therefore, the best results will be obtained from a late-maturing type such as the Large White fed at as high a level as possible. On the other hand there is much reason to believe that the most efficient consumption of food is incompatible with such a high nutritional plane. The general practice in pig feeding must, therefore, be a compromise between these two considerations.

One possible way of advancing maturity without too great an expense of food is, of course, to see that the health and comfort of the pig are maintained at the highest possible level. To discuss all that this involves would take too long, but it is clear that housing and attendance must be of the best, and that loss of condition from such things as parasites and minor ailments must be reduced to a minimum.

As a final consideration it should be understood that the present average standard of feeding and management in this country is not yet such as to permit of that rapid rate of growth which must be imposed on the late-maturing type of pig in order to obtain the best carcase quality. This explains why the Large White type of pig is not as popular as are the various crosses mostly to be found on farms. Until feeding and management are considerably improved it may not be wise to insist too much on its general adoption. Its use, however, with the best type of feeding and management which can be given, would seem to offer the greatest opportunity of achieving quality in bacon pigs.

Harpenden, Herts. H. R. DAVIDSON.

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THE SOCIETY'S GOLD MEDAL.

As was intimated in the Report to the Annual General Meeting on December 6th, 1933, the Council unanimously decided that the first recipient of the Society's new Gold Medal should be Sir Thomas Hudson Middleton, K.C.I.E., K.B.E., C.B.

Sir Thomas Middleton's services to Agriculture, first as a teacher and experimenter and latterly as an administrator, are felt to be fully worthy of the highest honour which the Society can confer.

He was Professor of Agriculture at Baroda College, India, from 1889 till 1896; Lecturer in Agriculture, University College of Wales, Aberystwyth, from 1896 till 1899; Professor of Agriculture, Durham College of Science, and Director of the Northumberland Experimental Farm (Cockle Park) from 1899 till 1902; Professor of Agriculture, Cambridge, from 1902 till 1907, Assistant Secretary to the Board of Agriculture from 1906 till 1919; Deputy Director-General of the Food Production Department from 1917 till 1919 and a Member of the Royal Commission on Agriculture in India from 1926 till 1928.

Since 1919 Sir Thomas has held the post of Commissioner under the Development and Road Improvement Funds Act and since 1929 has been Vice-Chairman of the Commission. In this capacity his breadth of knowledge and his mature wisdom have been of inestimable value to British Agriculture.

The Medal, which is illustrated below, bearing the inscription "De Agricolis Optime Merito," was presented by the Earl of Stradbroke (President) at the Council Meeting on May 30th, 1934.

PROFESSOR J. R. AINSWORTH-DAVIS, M.A.

James Richard Ainsworth-Davis was born at Bristol in 1861. Educated at Banbury Grammar School, the Royal School of Mines in London, and Trinity College, Cambridge, where he took First Class in both parts of the Natural Science Tripos, he was appointed Lecturer at the University College of Wales at Aberystwyth where from 1884 to 1908 he occupied the Chair of Zoology and Geology.

A strong and forceful teacher, Ainsworth-Davis's influence was not confined to the lecture room. He interested himself in the development of the social life of the students, and played a great part in the establishment of a Hall of Residence for women, a pioneer institution, and during his professorship he took a prominent part in building up the complete graded system of Education in Wales.

From 1908 to 1915, Professor Ainsworth-Davis filled the office of Principal of the Royal Agricultural College, a position to which he was appointed on the re-organisation of the College on the resignation of the Rev. J. B. McClellan. Under his leadership the contemplated changes in the constitution of the College, its affiliation with the University of Bristol, and its closer connection with the County Organisations and the farming community of the district, were brought about. He established a contingent of the Officers' Training Corps and the efficiency of the unit won the attention of those in authority, so that when the Great War broke out, nearly all its members received commissions in the army. The College was thus left without English students and with a greatly depleted staff, so that in 1915 it closed its doors for a period of seven years, thus defeating his nearly matured plan to erect a new wing, the foundation stone of which was to have been laid in November, 1914.

On the closing of the College, Professor Ainsworth-Davis continued his patriotic activities. At first attached to the Wiltshire Regiment, he was engaged in training the younger troops, and on retirement with the rank of Major, he acted as Chairman of the Central Civilian Advisory Board at G.H.Q. From 1919 to 1920 he acted as Assistant Secretary to the Service Students Bureau of the Board of Education, and from 1920–1922 he was Lecturer in Biology at the Middlesex Hospital Medical School, and up to his death on April 9th, 1934, he wrote and lectured on behalf of the Empire Marketing Board.

His wide interests are shown by the versatility of his writings. Children's verse ; a fairy operetta, "The Ivory Gate" ; food, and cooking were the subjects of his pen, while his more serious work includes books on Natural History ; a biography of T. H. Huxley ; part authorship of "Science in Modern Life," while in 1911 he edited a new and enlarged edition of Fream's Elements of Agriculture for the Royal Agricultural Society of England.

R. S. B.

REPORT OF THE RESEARCH COMMITTEE.

RESEARCH WORK IN PROGRESS.

THE Society, through its Research Committee, has continued to assist agricultural research by means of financial grants towards the cost of several investigations. The following report deals shortly with the more important developments of the past year.

ROTHAMSTED EXPERIMENTAL STATION.

SUMMARY OF RECENT AND CURRENT WORK ON LEGUMES.

1. *Lucerne Inoculation.*—Inoculation of lucerne by a process developed at Rothamsted has been carried out on a commercial scale for the past five years. Cultures are issued by Messrs. Allen and Hanburys by arrangement, and sample tubes of culture are tested at frequent intervals by Dr. Thornton's department to ensure the maintenance of a high standard of inoculum. Last year 5,900 cultures (sufficient to inoculate 4,000 acres of lucerne) were issued. The average annual issue for the last five years was 5,500 cultures.

2. *Clover Inoculation.*—During the past three years a start has been made with the more difficult problem of clover inoculation with especial reference to the mountain pastures in Wales. The field work in this investigation is at present being carried out by the Welsh Plant Breeding Station. The problem, from a bacteriological point of view, differs from the more straightforward case of lucerne where the appropriate nodule bacteria were found to be absent from the soils of a large part of Great Britain.

In the case of clover, there is evidence that the Welsh soils contain certain strains of nodule bacteria which, although capable of producing nodules upon the roots, do not benefit the plant. One of these "parasitic" strains from Wales and a similar strain isolated in America are being studied in sand culture. It is found that the presence of these "parasitic" strains actually depresses the growth of the clover. However, after testing a large series of strains of clover nodule bacteria, two beneficial strains have now been obtained whose vigour is so great that seed inoculated with them will largely resist the presence of parasitic strains in the soil. A pot experiment

now running gave, after six weeks' growth, the following results from a count of the number of leaves per pot of nine plants :—

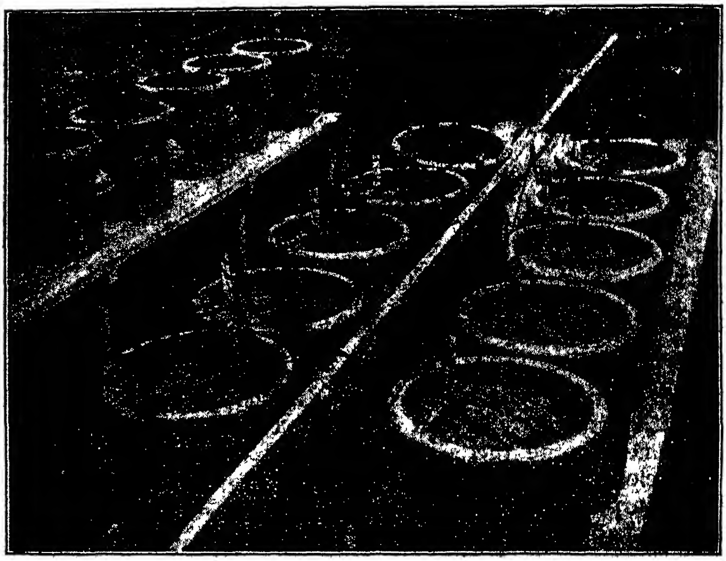
POT EXPERIMENT WITH ALSIKE CLOVER GROWN IN UNSTERILISED SAND.

	Series.	No. of Leaves per Pot (means of five replicate pots).
I.	Uninoculated	55·2
II.	Sand containing American ineffectual strain. Seed uninoculated .	39·4
III.	As II, but seed inoculated with virulent strain A	56·2
IV.	Sand containing Welsh ineffectual strain. Seed uninoculated	40·2
V.	As IV, but seed inoculated with strain A	47·0

It was supposed that the weakness of clover in many of the Welsh pastures was connected with the presence of these parasitic strains which can be isolated from the soils. Field experiments were therefore begun to test the effect of wild-white-clover seed inoculated with strain "A" which has been found in pot cultures to be capable of overcoming or mitigating the effects of the presence of a parasitic strain. For comparison with this strain, plots were also sown with clover seed inoculated with five other strains, three of them, B, C, and R obtained from Sweden and two, Wisconsin 200 and Wisconsin 209, from America. Plots were also inoculated by spreading soil from an old clover field. These five strains were all claimed to be efficient. In the following table the effect of the different strains is shown as measured by the percentage area of turf covered with the clover. Each type of inoculation was tested with two different dressings of phosphate. The results show that strains A and C give the greatest benefit. These will be further tested.

Seed inoculated with Strain.	Percentage areas covered with Clover. Land receiving— 5 cwt. slag.	10 cwt. slag.
A	18·6	24·6
B	5·0	15·5
C	26·8	30·5
R	11·3	11·3
Wisc. 200	5·6	16·5
Wisc. 209	10·3	22·0
Inoculation by spreading soil	6·8	13·0
No inoculation	3·2	4·5

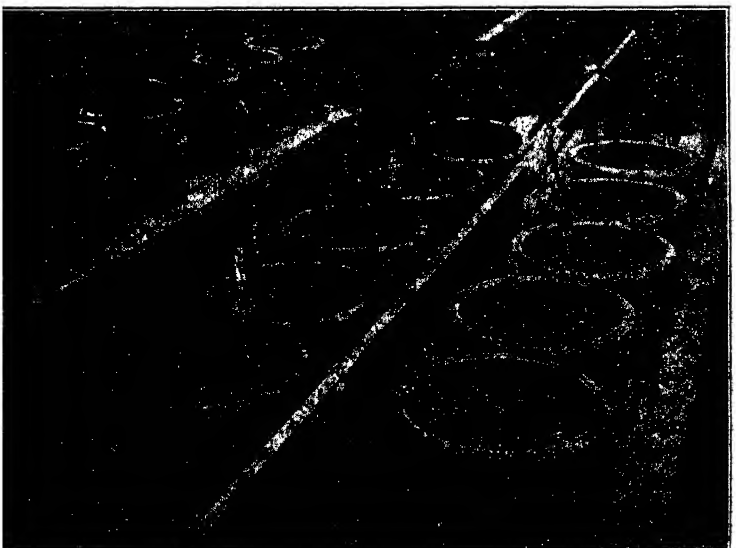
It is to be expected that "parasitic" strains of nodule organisms will be found to be widely distributed and the use of inoculation for clover in such cases will have a widespread application in other districts. It is possible that some cases of clover sickness are due to harmful strains of bacteria.



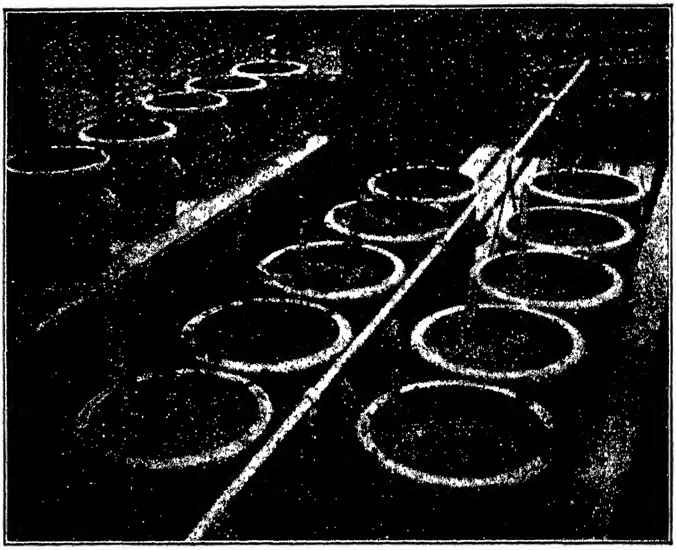
Left—Control.
Right—Parasitic Strain "Coryn" in Sand. Seed not inoculated.

Left—Parasitic Strain "Coryn" in Sand. Seed inoc. Strain C 5/2.
Right—Parasitic Strain "Coryn" in Sand. Seed not inoculated.

Left—Parasitic Strain "Coryn" in Sand. Seed inoc. Strain A.
Right—Parasitic Strain "Coryn" in Sand. No seed inoculation.



Left—Control.
Right—Parasitic Strain 202 in Sand.



Left—" 202 " Parasitic Strain in Sand. Seed inoc. Strain A.
Right—Parasitic Strain 202 in Sand. No seed inoculation.

Rothamsted greenhouse experiments with clover strains, 1934: Second experiment. Interim photographs showing depressing effect of Welsh indigenous " Coryn " strain and of " 202," largely overcome by seed inoculation with " A " and C 5/2.

3. *Uptake of Nitrogen by Grass growing with Inoculated Lucerne.*—In sand culture experiments it has been found that Italian ryegrass growing with lucerne gained in nitrogen, derived from the activity of the lucerne nodules, within three to four months of sowing. This suggests that nitrogen compounds are actually excreted from the lucerne roots.

4. *Effect of cutting Lucerne upon the Nitrogen in Tops and Roots.*—The effect of cutting lucerne upon the length of stand is a point of considerable practical importance. This problem is bound up with its effect upon root reserves. A pot experiment to investigate this point gave results showing that the total nitrogen fixed was not appreciably affected by two cuttings in the seedling year but that cutting resulted in a loss of nitrogen from the roots, owing to transference to the tops where it was removed in the cuttings.

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THE MEASUREMENT OF POWER CONSUMPTION BY BARN MACHINERY.

Quantities of data are being accumulated to show how many units of electricity are needed to do the ordinary kinds of work about farm buildings. Comparisons are also being made with the quantity of paraffin and of petrol consumed in doing the same work. The measurements have proved to be more difficult than was at first expected, owing to the considerable variations in power or fuel consumption that occur according to the conditions in which the work is done. These are gradually being investigated and reduced to order. The difficulty is well illustrated by the grinding tests.

The number of units required for grinding one ton of barley meal was 5·3 when the fineness was such that 7 per cent. passed through the standard sieve, and 35 when 61 per cent. passed through the sieve. An important question arises here: how finely should the meal be ground? There is obviously no point in going beyond what is needed.

A curve shows clearly how the fineness of grinding and the consumption of power are related, the speed of grinding being the same in all tests. The moisture-content of the grain is another important factor in determining the power consumption. Barley grain as threshed and stored for grinding may contain from 8 to 22 per cent. of moisture. The lower the moisture content the less is the power consumed.

The rate of grinding also affects the number of units required. As an illustration: for grinding to give 40 per cent. fine meal the consumption is 15 units per ton at a grinding rate of 12·6 cwt. per hour, and 19·0 units per ton at 4·4 cwt. per hour.

The smaller power consumption per ton thus occurs for low percentages of fine meal and high rates of grinding; the higher power consumption for high percentages of fine meal and low rates of grinding. The extreme values found in these tests were as follows:—

5·3 units per ton at a grinding rate of 12·6 cwt. per hour (7 per cent. fine meal).

35·0 units per ton at a grinding rate of 4·4 cwt. per hour (61 per cent. fine meal).

The values given by the routine grinding operations on the farm vary from 9·9 units per ton at a grinding rate of 12·0 cwt. per hour to 28·8 units per ton at a grinding rate of 2·5 cwt. per hour. Under constant conditions "spot tests" give practically the same results as the "overall readings" as shown by the following figures:—

Mean of Spot Tests.	Overall Readings.
17 units per ton at a grinding rate of 7·2 cwt. per hour. Motor developing 7·18 h.p.	16·3 units per ton at a grinding rate of 7·5 cwt. per hour. Motor developing 7·11 h.p.

A considerable body of data is being accumulated, during the threshing of oats, wheat and barley, to compare electricity and oil as sources of power, and a new tractor is being compared with an old one. It is as yet too soon to present these data, but it is hoped to trace the connection between power consumption and the conditions of working, and to reduce the data to order as is already being done in the case of grinding.

Examination of Woburn Data.

The data available for statistical examination are the annual yields of grain and straw on the permanent wheat and barley plots from 1877 to 1926 and on the rotation plots from 1877 to 1931. An investigation of these was made by Miss A. M. Webster. This fell into two main sections: (1) the slow changes in yield in relation to manurial treatments; (2) the influence of meteorological factors on the annual fluctuations of the yields.

This investigation was exhaustive, and most of the information available in the data appears to have been abstracted. The examination has revealed, in particular, that the influence of meteorological factors on crop yields is complex. It seems likely, however, that little additional information will be gained on this point, by the present methods of statistical analysis, until some new theories are brought forward as to which combinations of meteorological factors are important in influencing yields. The only new investigations on the permanent plots have been: (1) an examination of the correlation between the yield of total produce and the ratio of grain to total produce,

after eliminating the effect of slow changes in yield. This shows that on the plots receiving no nitrogenous manure the percentage of grain increases in a year of high yields, whereas on the plots with high nitrogenous manures the straw increases more than proportionately in a good year and the percentage of grain tends to fall; (2) to investigate the importance of non-linear terms in the effect of rainfall on wheat yields, the regressions of the yields of the permanent plots were worked out on March-April rainfall, its square and its cube. This had previously been done for barley, in which case the quadratic and cubic terms were found to be of importance. The rainfall curves obtained indicate, as with barley, that the average rainfall was too high on all plots. The curves, however, indicated a significant effect only on two of the plots; (3) previous examination showed that the deviations from the long-term polynomials of plots receiving the same type of manurial treatment were more closely associated than those of plots receiving different types. An investigation was made in order to see whether this effect persisted after taking account of the effect of rainfall on the yields. The investigation was made for barley and the weather variates chosen were March-April rainfall, its square and cube, and rainfall 60-90 days after sowing and its square, these being the factors which appeared to have the strongest influence on yields. The association according to manurial treatment persisted after taking account of the rainfall effect. This indicates the presence of undiscovered meteorological factors which act alike in plots with the same type of manuring.

The main part of the work has been the writing of a report of the investigations made. This is well advanced, and the following sections are completed: (1) The influence of meteorological factors on the annual fluctuations of the yields; (2) the percentage of nitrogen in the barley grain; (3) the rotation experiments. More than half of the section on the slow changes in yield in relation to manurial treatment has also been written.

TRIALS AT THE NORFOLK AGRICULTURAL STATION.

The Economic Disposal of Sugar-Beet By-Products.

This investigation was continued at the Norfolk Agricultural Station during the past year in two sections:—

1. The manurial value of sugar-beet tops when fed to sheep and when ploughed in.
2. The feeding value of wet sugar-beet pulp for fattening bullocks.

Reports on the feeding value of sugar-beet tops and dried sugar-beet pulp for fattening bullocks and on the feeding value of sugar-beet tops for fattening hoggets have been given in previous issues of this Journal.

1. *The manurial value of Sugar-Beet Tops when fed to sheep and when ploughed in.*—The manurial value is being measured by obtaining the yields of the following barley and successive crops in the rotation. The investigation was begun in 1930, and has been continued each year since. The yields obtained during the past year have been those of the "seeds" hay succeeding the barley crop, and of wheat succeeding the hay.

Over the average of the three years, the effect of folding sugar-beet tops or swedes has been to increase the yield of the succeeding barley by about 7 to 9 bushels per acre, the higher increase being obtained where beet tops have been folded. An increase in yield of about eight bushels per acre has also been obtained by ploughing the beet tops in, or by carting the tops off and applying a mixture of complete artificials, costing at present prices just under £1 per acre.

Three years' results have also been obtained for the second crop in the rotation, namely, "seeds" hay. On the average it would appear that the effect of sheeping or of ploughing in the beet tops is to increase the yield of this crop by some 5 cwt. per acre.

Two years' results are available for the wheat crop (the third crop in the rotation). The results show a small increase in yield of grain where the beet tops or swedes were folded for the barley. Ploughing in the beet tops has so far not resulted in an increased yield of wheat.

2. *The feeding value of wet Sugar-Beet Pulp for fattening bullocks.*—This investigation was continued for a second year, the comparison of the feeding value of wet beet pulp and mangolds being made by feeding either beet pulp or mangolds to two yards of ten bullocks each.

Both lots of bullocks received the same amount of hay and concentrates. The mangold group were fed 125 lb. of roots per head per day throughout the whole of the trial. The pulp group of bullocks received 65 lb. of fresh pulp per head per day for the first ten weeks, and for the remaining six weeks, 57 lb. of ensiled pulp. The ensiled pulp had been three months in the clamp before being fed. When receiving fresh pulp the bullocks increased in weight at the rate of 1·7 lb. per head per day. Over the corresponding period the live-weight gain of the bullocks being fed mangolds was 2·2 lb. each per day. During the period that ensiled pulp was fed to one yard, both lots of bullocks increased in weight by 1·4 lb. per head per day. Over the whole sixteen weeks of the trial, the daily live-weight gains of the pulp group and the mangold group were 1·8 lb. and 2·1 lb. respectively.

The results of the first year of this trial were similar to those already given for the second year. Combining the two years' results, the average live-weight gain of the bullocks on fresh pulp was 1·8 lb. compared with an average daily live-weight gain of 2·2 lb. for the bullocks on mangolds. The figures for the daily live-weight gains of the bullocks fed on clamped pulp and on mangolds were 1·6 and 1·8 lb. respectively. In neither year did wet pulp feeding have any noticeable effect on the quality of the carcase.

This trial is, however, being continued this winter for the third year in succession, and therefore at present no final conclusions can be drawn.

MASTITIS IN COWS.

Research work on Mastitis has been continued at the Research Institute, Royal Veterinary College, London, during the year 1933–34, and the present position of the work may be considered under the following headings.

1. *The Bacteriology of Mastitis.*—The two preceding reports to the Research Committee have dealt with the *streptococci* which are associated with most of the cases of mastitis in cows in this and other countries. In the last report, however, reference was also made to a form of the disease which is caused by rather different micro-organisms which are known as *staphylococci*. It was pointed out that staphylococci produce a form of mastitis in which there is a tendency for parts of the udder to become gangrenous, and although this does not appear to be very common in cattle it is serious inasmuch as it frequently causes the death of the affected animal. It is now evident that in addition to this fatal form, staphylococci can set up what may be termed a "low-grade" mastitis, that is to say, a mild inflammation which causes slight and continuous deterioration in the properties of the milk. Indeed there have been published reports which suggest that, when large numbers of *staphylococci* of the particular kind being considered are present, the milk in the raw state may set up intestinal disturbance in human beings. It has been found that such *staphylococci* are very common inhabitants of cows' udders, although their presence does not, as a rule, lead to *obvious* disturbance. Thus, out of 200 cows belonging to three herds which were examined, 70 (35 per cent.) were found to be infected. It has also been ascertained that these *staphylococci* under certain conditions produce a powerful poison or toxin and that the blood of infected cows contains varying quantities of an antagonistic substance or antitoxin. These toxins and antitoxins have been the subject of much investigation at this Institute during the past year.

To give an example illustrating the potency of these toxins and the neutralising effect of antitoxin, it may be mentioned that a few drops of toxin injected into the blood of a rabbit will cause the death of the animal within a few minutes. If a little antitoxin is given to a rabbit prior to injecting the toxin, the fatal effect is avoided. As with the toxins of several other species of bacteria, *staphylococcus* toxin, when treated with formalin, loses its poisonous properties, but, fortunately, the non-toxic product so obtained is still capable of stimulating the formation of antitoxin when injected into the body, and some of this antitoxin filters through into the milk. There is, therefore, a real possibility that in a herd where cases of gangrenous mastitis are common, the injection of formalinised toxin prior to calving would have beneficial results. It is also likely that if a sufficient amount of *staphylococcus* antitoxin could be injected early enough into a cow already showing symptoms of gangrenous mastitis, the cow's life at least could be saved. Whether formalinised toxin could be used to free an infected udder from these *staphylococci* is more debatable, but it is a point worthy of investigation. Consequently, these studies will be continued. Finally, it should be said that *staphylococcus* mastitis is comparatively common in ewes after lambing so that discoveries in connection with the problems under discussion may have a still wider application.

2. *Diagnosis.*—The necessity in many cases of making a bacteriological examination of the milk for purposes of picking out infected cows is now generally agreed. A new bacteriological culture medium for this purpose has been devised in the Institute and its value has been established. A detailed account of this work has been published (1).

It is fairly widely known that a proportion of cases of mastitis which have not reached the clinical stage can be detected in the cowshed by examining the milk of individual animals. The methods used include an examination of the fore milk with a "strip-cup" and the taking of the reaction of the milk with brom-cresol-purple papers. The value of such methods in comparison with a bacteriological examination of the milk has been worked out during the past year, and full details will be found in a recent publication (2). Briefly, the usefulness of cowshed methods has been recognised, but they are less efficient than a proper laboratory test. Moreover, it has been found that in about 10 per cent. of cases the results are misleading and are likely to cause the rejection of cows which should be retained in the herd.

3. *Prevalence of streptococcus mastitis in cows.*—The records which are accumulating in the Institute continue to show the

wide prevalence of this disease. So far milk samples from 2,530 cows belonging to 48 herds have been examined. Of these cows, 970 (38 per cent.) were found to be infected in at least one quarter, the percentage varying from 10 to 71 in individual herds. No relationship could be obtained between the extent of infection and the class of herd.

4. *Control.*—As mentioned in last year's report of this Committee, control measures consist of picking out infected cows and having them milked last. Seven herds comprising at the start some 550 cows are now under observation. The "healthy" cows in these herds are examined at intervals of about three months. One of these herds (see last report to the Committee) has been free from infection for practically five years. A second herd appears to have been free from infection since July, 1932, a result to be attributed largely to extensive selling of infected cows. In a third herd no obvious cases of mastitis have developed during the past three years, but a number of the cows continue to harbour *streptococci*, these organisms being found in quite small numbers and only at irregular intervals. All seven herds remain under observation.

Following upon favourable reports from the Continent, attempts are now being made to test the value of treating infected cows by infusing certain chemical substances into the udder through the teat canal. Should this prove successful, the procedure could be used in conjunction with the control measures referred to above. This work has not yet proceeded very far, but it does appear to show that many early cases respond favourably to the chemical compound known as "entozon" and that the milk yield is not interfered with to an important degree. On the other hand, cows which are heavily infected and in which the disease has been present for some time, are more resistent to the treatment. Further details are reserved for a future report.

5. *General.*—An article dealing with the progress of recent research on bovine mastitis was presented to the Twelfth International Veterinary Congress at its meeting in New York, in August, 1934. This article will be printed in the Proceedings of the Congress.

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THE FARMER'S GUIDE TO AGRICULTURAL RESEARCH IN 1933.

For the past nine years, the Royal Agricultural Society of England has issued annual summaries of Agricultural Research, as carried on in its leading branches, prepared under the direction of the Research Committee of the Society. The publication, originally issued under the title of *Agricultural Research*, is now known as *The Farmer's Guide to Agricultural Research* for this describes the main purpose with which the Society undertook the work, namely, to spread the lessons of research among those to whom they are likely to be of greatest use by giving the farmer information on the results of the year's work of the experimental stations in a summarised and simple form.

The survey of scientific work which it provides is not limited to research conducted in the British Isles, but includes references to the results achieved in any part of the world from which light may be thrown on the problems of British agriculture.

As last year, *The Farmer's Guide* forms a section of the Society's *Journal* so that it may be in the hands of every member of the Society. At the same time a number of copies are being bound separately for distribution to the Press and to centres of Agricultural Education and Research.

The Authors responsible for the various sections are the same as those who contributed to the issue of the previous year.

A few copies of previous issues (for the years 1925–1932) are still available.

CROPS AND PLANT BREEDING.

I.—INTRODUCTION.

THE first section of this article deals with the sugar beet crop. The survival of sugar beet growing in this country is largely bound up with the problem of increasing the efficiency with which a pound of sugar is produced at the factory. From the growers' point of view much can still be done. It therefore seems an opportune time to review the whole situation, that growers may see to it that they at least are not holding up the development of the industry. The more important considerations to be borne in mind by all beet growers, in order to obtain the best reward for their labours, have thus been dealt with as fully as possible.

Although as yet nothing of direct practical importance has resulted from the recent researches in potato breeding, yet the extreme importance of what has been done will be recognised by all potato growers. The problems of blight resistance and of the supply of virus-free stocks have been with us too long, and there is every reason to believe that the next few years will see important progress towards their solution. Virus research is slowly but surely increasing the knowledge of virus diseases to a point where practical control will be possible.

Perhaps the problems connected with synonyms have been a source of worry and confusion more to the plant breeder and the agricultural expert than to the farmer. The great importance of the findings of the various Synonym Committees will be realised by all growers when they have a fuller knowledge of the existing state of affairs. Probably no single line of agricultural research on crop plants affects the farmer more directly than does the unravelling of the chaotic muddle in varieties of crops. This is an aspect of agricultural research which no agriculturist can afford to neglect.

II.—Sugar Beet.

The Present Situation.

The future of the Sugar Beet Industry in this country is still a matter for speculation. The subsidy which came into operation in October 1924, and was due to expire in 1934, has been extended for another year in order to give the industry time to "rationalise" and put forward a working scheme for government approval. In other words, sugar beet growing has either to work out its own salvation or else submit a justifiable plea for future financial help from the exchequer. Up to the present over £40,000,000 of public money has been diverted into this branch of agriculture, and there are many who are asking if it is worth while bolstering up an industry which seemingly can never be self-supporting.

There can be no doubt that the subsidy has been instrumental in establishing an important industry in this country. Factories have been erected all over it and large amounts of capital have been invested. From the agriculturists' point of view sugar beet growing has been in many parts of the country the one bright spot during the last 10 years of depression. Other countries such as America, France and Germany, have all found it necessary, and deemed it wise, to subsidise sugar beet. Great Britain has spent a mere fraction of the sums that these other countries have, and the industry has expanded by leaps and bounds. Let us examine the figures which show this expansion.

The first factory was opened at Cantley, Norfolk, in 1912, and there was an immediate increase in the area of the crop from 500 to 4,000 acres. The subsidy in 1924 supplied the next impetus, and by 1930 there were 347,257 acres. 1934 showed a further increase to some 396,500 acres which was a record for this country. Since 1928 Great Britain has increased her annual export of sugar from 80,200 tons to 373,600 long tons raw value. The European figures show that Great Britain has become one of the leading sugar exporting countries,

due to the great expansion of the sugar refining industry, but in 1933 home production supplied only £4·7 million out of a total sugar requirement of this country valued at £23 million. From these figures it would appear that there is no lack of a market for sugar beet growers if they can but produce in a manner to compete with foreign sugar.

In 1933, on our 363,000 acres of beet, 3,306,000 tons of roots were raised which yielded 9,262,000 cwt. of sugar. The average yield for the country was 9 tons per acre, and the average sugar-content was 16·4%. But the real efficiency of the industry is best measured by the number of pounds of sugar produced per acre. For the last three years the figures have been :—

1931	2316 lb. sugar per acre
1932	2896 „ „ „ „
1933	2737 „ „ „ „

It is of interest to compare the sugar production per acre in this country with that of the leading sugar beet growing countries of Europe. The latest complete figures available are for the period 1926–29 (Ref. 1).

	Total Yield per Acre.	Yield of Sugar per Acre.
Netherlands	13·10 tons	3929 lb.
Belgium	10·98 „	3557 „
Germany	9·91 „	3668 „
France	9·11 „	3142 „
Great Britain	7·11 „	2493 „

From these figures it can be seen that, even taking into account the improvements in this country since 1929, there is still room for further improvement in sugar production. To increase the efficiency of the industry, more sugar must be produced per acre and costs must be cut to a minimum. Growers of sugar in this country have not only to compete with foreign beet sugar, but also with tropical cane sugar which is produced more cheaply, largely by native labour. This competition can only be met by reducing the cost of production of a pound of sugar, and the most obvious method of doing this is to increase the yield of sugar.

The Yield Problem.

Now what are the means by which yield of sugar can be increased ? Total yield of beet per acre and percentage sugar in the beets, are the two governing factors. Let us examine the means by which the grower can increase his total yields and sugar percentage.

Variety. Recent research work has done much to increase our knowledge of sugar beet varieties, and improved varieties are now available whose behaviour with regard to total yield and sugar yield, under the conditions of growth in this country, are well known. Before discussing the extreme importance of choosing the right variety for obtaining the best results, it will be of interest to understand how these varieties have been evolved by plant breeders.

All cultivated beets have been derived by selection from the wild beet which grows on the shores of the Mediterranean. This wild species is very variable and amongst other things contains strains varying in sugar-content from less than 1 per cent. up to nearly 20 per cent. (Refs. 2 and 3). By selecting the strains with the highest sugar-content breeders have been able to put on the market varieties whose sugar-content varies from 16 to 18 per cent. The full story of the gradual improvement of sugar beet varieties since Achard first obtained white sugar from sugar beet is of great interest, and a concise account is given in Ref. 4.

Breeders have found that by rigorous selection of the best types from the wild species it is possible to produce, in five or six generations, strains comparable to the cultivated varieties. But the sugar beet is naturally out-pollinated, so that it is very difficult to keep stocks pure. Early breeding work was based on the so-called "mass selection" method, in which the best plants were selected and allowed to out-pollinate to produce seed to start new varieties. Such a method can only lead to a mixed population varying in sugar-content, and constant re-selection has to be practised to keep up the sugar percentage.

Modern breeding methods have improved on this. Plants of high sugar-content are made to pollinate themselves, and inbreeding is practised for several years in an endeavour to "fix" the strains. Inferior strains are eliminated by destroying the whole of the progeny of any plant, if any one of its offspring compares unfavourably with the standard required. The selected strains are then grown in pairs and allowed to cross pollinate, so as to restore the vigour that has been lost during inbreeding. Such strains derived from hybridisation are less variable in sugar-content, and yield more, than pure-line strains, or strains from mass-selected stock (Refs. 5, 6).

Until recently, sugar percentage has been the guide for the breeder in selecting his "élite" strains for hybridising. But it is now realised that sugar beet is possessed of that most subtle and elusive of all characters—quality. Quality in sugar beet determines the amount of sugar that can be extracted from the roots at the factory, and is affected by variety,

climate, soil and fertilisers. Some varieties will yield a higher percentage of their total sugar than others, and a reasonably quick and accurate method of estimating the yield of sugar to be expected from a given beet sample has been developed (Refs. 7, 8). This is based on an estimation of the molasses-formers in the roots. Another method is based on the composition of the ash of the beet. Thus according to Dahlberg, beets with high nitrate-content are invariably of poor quality as measured by the quantity and purity of sugar that can be extracted from them; while high chloride-content usually means low sugar-content. Dahlberg concludes from this that breeders should select their élite strains for hybridisation on the basis of low nitrate- and chloride-content, as well as on high sugar-content (Ref. 7).

If the breeder is to feel sure of his ground he must know whether the characters he is selecting are inherited. There is evidence that the constitution of the ash mentioned above is heritable. With regard to sugar-content, Colin and Boulgy have recently done work to show that it also is a definite heritable character (Refs. 9, 10). By crossing mangolds (7·5 per cent. sugar) with sugar beet (13 per cent. sugar) they found that it was possible in subsequent generations to select strains that had a higher sugar percentage (15 per cent.) than either parent. It thus seems possible that sugar-content can be improved by hybridisation.

But is this necessary at present? It is almost certainly the case that the varieties already available to the grower are not being used to the maximum limit of their sugar production per acre. Using the varieties on the market at the present moment there is little doubt that the general level of sugar production could be appreciably increased. The limitation to sugar yield is generally due to two factors—bad management and cultivation, and lack of knowledge concerning the varieties. First let us consider the question of variety. What are the best varieties to grow under different conditions in this country?

There are three strains or types of varieties available to the grower, *viz.*:—

1. High-yielding with low sugar percentage. ("E" Strains).
2. Medium-yielding with medium sugar percentage. ("N" Strains).
3. Low-yielding with high sugar percentage. ("Z" Strains.)

In the preliminary trials carried out by the National Institute of Agricultural Botany (Ref. 11) it was pointed out

that the Z strains are more suited to the wetter conditions in this country, while the E strains do better under drier conditions. Since these preliminary trials the Institute has carried out more extensive investigations which may be summarised as follows (Refs. 11, 12).

The variety Kleinwanzleben E appears to be the most lucrative for general cultivation, for in spite of its low sugar-content, its exceptionally high yield of roots enables it to produce more sugar per acre than any other variety. It has very little tendency to bolt, and is therefore suited to early sowing. The large amount of tops produced makes it unsuitable for growth on rich soils, but where the tops are useful for feeding this may be a valuable character. Two other varieties, Dorbrovice N and Kleinwanzleben N, are, from the point of view of cash returns, close runners-up to Kleinwanzleben E. They do not, however, yield such a high crop of sugar per acre.

In the Fens, where the tops are liable to grow too large, the variety Marsters Z is to be preferred to Kleinwanzleben E, which also, under Fen conditions, tends to produce excessively large, coarse, low-sugar-content roots. This may be an important disadvantage where freightage is high.

Another interesting point tested by the Institute was the effect of place of origin of the seed on the subsequent yield. Some growers believe that the best results can only be obtained with continental seed, so English and German seed of Kleinwanzleben E were compared. The English seed had a higher germination capacity, and gave a higher plant population, a most important consideration which will be discussed later. The German seed tended to give roots of higher sugar-content, but this was offset by the higher plant population of the English, so that there was little difference in final yield of sugar per acre.

While still discussing the variety question it may be as well to mention the Institute's trials on the effect on the sugar yield of time of lifting the roots. As is well known, the sugar-content of roots increases up to the end of October, and then declines. Kleinwanzleben E, N and Z, and Marsters Z were tested at fortnightly intervals, starting at the end of September when the varieties were scarcely mature. As would be expected, the weight of roots increased with each successive lifting in each variety; Kleinwanzleben E having, on the average of the three seasons covered by the trials, the greatest weight of roots. The differences with regard to sugar-content between the varieties were small. At any period of lifting, Marsters Z is likely to have the greatest sugar percentage, followed in order by Kleinwanzleben Z,

N and E. There was little of economic importance in the total sugar yield at the different times of lifting, but Marsters Z gave slightly better results than the others up to mid-October, while Kleinwanzleben E was more suited to September lifting than the others.

Summing up the variety question, there is no excuse for farmers growing inferior or unsuitable varieties. The best varieties in existence are at his disposal, and from the knowledge available concerning these varieties, a grower should have little difficulty in choosing the strains that are most likely to yield him the largest financial returns. To show what can be done under good conditions in this country, the particulars of the crop obtained by the Mason Challenge Cup winner in 1932–33 may be examined. The total yield was over 21 tons of roots per acre, with a sugar percentage of 15·9, giving 7,594 pounds of sugar per acre.

In 1930 it was calculated that 18 per cent. of the growers in this country were producing less than 6 tons of beet per acre, while 42 per cent. were growing between 6 and 10 tons per acre. The remaining 40 per cent. showed returns of over 10 tons per acre (Ref. 31). The reasons for this unsatisfactory state of affairs are many. Growing on unsuitable soils and under unfavourable climatic conditions is probably the most important reason, but bad management and cultivation, and the growing of inferior or unsuitable varieties, also play their part.

Management and Cultivation. Generalisations concerning methods of management and cultivation are notoriously dangerous. Every case, strictly speaking, requires special consideration. This also holds when interpreting the results of investigations, and it goes far to explain apparently contradictory results obtained by workers investigating the same problems under different sets of conditions. When sifting out the data accumulated by research workers all over the world, the best that can be done is to correlate the results, and try to pick out the significant conclusions about which there is a more or less general agreement.

There is one matter of great importance in sugar-beet cultivation which has attracted a great deal of attention, and that is the effect of plant population on the yield of roots and sugar per acre. In the 1929 issue of this Guide (Ref. 13) the importance of an even and full plant, and a relatively high number of plants per acre, was mentioned. Soucek (Ref. 14) stated some years ago that the greater the plant population, the higher was the yield, although, of course, the roots were smaller. De Haan and Klejnhout (Ref. 15) confirmed this

and went further by stating that this relationship holds under all conditions of soil.

Recently Willcox (Ref. 16) has calculated theoretically the exact relationship between number of plants and the resultant yield. The theoretical considerations on which these figures are based cannot be discussed here, and there are doubtless many scientific workers who would not be prepared to accept them. The figures are, however, relevant to this discussion, and are given below.

10,700	plants	per	acre	produce	50%	of	theoretical	maximum	yield
21,400	„	„	„	„	75%	„	„	„	„
32,100	„	„	„	„	87·5%	„	„	„	„
42,800	„	„	„	„	93·75%	„	„	„	„

Examination of these figures shows that increase in the number of plants increases the yield in a characteristic manner. Thus if we take 20 tons per acre as the theoretical maximum yield for a given field, 10,700 plants per acre will give 10 tons, 21,400 15 tons, 32,100 $17\frac{1}{2}$ tons and 42,800 $18\frac{3}{4}$ tons. Thus as the yield and plant population become higher, it becomes more and more difficult to raise the yield by increasing the number of plants. This, after all, is what would be expected. Willcox, it may be noted, puts the theoretical maximum yield of sugar beet under ideal conditions in U.S.A., and using the varieties at present available, at 53· short tons (47 English tons) per acre. Yields up to 80 per cent. of this have been obtained with beet grown under irrigation in the U.S.A.

In this country, in 1930, growers were averaging 17,500 plants per acre, while Belgian and German growers were obtaining 22,000, and Dutch growers about 25,000 (Ref. 17). Averages may in fact be misleading, since the inclusion of a few extreme figures can give an entirely erroneous picture; but it is significant that in the European countries mentioned above, yields are higher than in this country. The evidence then does go to show that the general average of beet yields in this country could be raised if more attention were paid to the plant population question. Growers should aim at obtaining about 30,000 plants per acre.

In summing up this question of plant population and yield, it should be mentioned that trials carried out in the Eastern Counties during the last few years have failed to show any significant increase in yield with increase in plant population above about 25,000 plants per acre. The relationship is not as simple as was at first thought. Soil conditions and variety must play an important part. On poor thin soils, where the roots do not get the chance to grow well, it is obviously most important to have a high plant population.

On good soils, with a heavy-yielding variety, low plant populations may yield satisfactorily.

Speaking generally, it is always desirable to start with a full and even plant: patchiness is bad under all conditions. Good germination depends primarily on the seed bed and weather conditions immediately after sowing, but there is also the question of the seed. Sanders and Garner (Ref. 18) have found that beet seed treated with sulphuric acid gives quicker and more even germination than untreated seed, particularly in a dry seed bed. Mechanical milling of the seed also improves the germination, and consequently the number of plants per acre, but is not as efficient as the sulphuric acid treatment. Both treatments resulted in higher yields per acre due to the greater number of plants, and it was calculated that the financial gain by treating the seed was as much as 73*s*. 3*d*. per acre in the dry year of 1929, and 38*s*. 0*d*. in 1930.

Other workers have found that treating the beet seed with various chemicals before sowing increases the germination capacity (Ref. 19), while more recent work has shown that treatment with manganese chloride or magnesium chloride has increased the productiviity per acre. This increased productivity was mostly due to increase of sugar-content, but there was also some increase in root size (Ref. 20). Seed treatment will probably soon become a recognised practice in sugar beet culture, and many beet factories now offer milled or sulphuric acid-treated samples.

In addition to the establishment of a full and even plant at sowing, the vital effect of singling on plant population must be mentioned. Careful and selective singling whereby the best and healthiest plants are left, fully and evenly distributed throughout the field, is of vital importance in connexion with the effect of population on yield. Singling is often done indifferently. Poor plants, which can never grow to good roots at maturity, are left standing, while spacing is uneven and gaps too prevalent to make the most of the available ground.

The effect of time of sowing on yield is another point of importance in connexion with which Roemer, working in Germany, has obtained some interesting results (Ref. 25). He maintains that under the conditions of his experiments every day lost in the first half of April meant loss of root yield, sugar yield and tops. In the second half of April each day lost meant reduction in yield of roots and sugar only. The earlier in spring, the more significant was each day's difference in sowing time, and for increasing the yield early sowing was more important than delayed harvest. Thus the grower, if he sows

too late, can never make up for lost time. Roemer found as much as 15 per cent. yield difference when sowing was delayed for 10 days. Early sowing also gave a less gappy plant, though the percentage of bolters was somewhat higher. Finally, Roemer stresses the importance of early sowing because it allows of singling at the correct time. Delayed singling is obviously bad, as it checks early growth which the plants can never make up. In this country, sowing after the end of April generally means considerable reduction in yield. It is probably safe to say that sowing should be done as early in April as is compatible with the making of a good seed-bed.

The one great danger of early sowing is that it encourages bolters. Sowing extremely early (end of February) often produces an enormously high percentage of bolters. Thus, in 1927, trials with Kleinwanzleben E and other varieties showed a reduction of bolters from about 50 per cent. to 10 per cent. between sowings at the end of February and the 15th of March. The experiments were repeated in 1928, but the same results were not obtained; in general, however, the trials showed that the percentage of bolters was highest in February sowings, and decreased as sowing was delayed until the end of March, when it became negligible (Ref. 22).

Varieties may show a tendency to early or late bolters. Those varieties with the highest bolting propensity have the highest percentage of early bolters, and early sowing requires a variety with low bolting propensity. Late bolters are not such a loss to the grower as are early bolters, because the former do not exhaust themselves of sugar so completely as do the latter.

Finally, to complete the consideration of factors affecting yield, some reference should be made to manuring. The results of recent work on sugar beet manuring are given in the Soils and Manures section of the 1933 issue of this publication (Ref. 24). All that need be stressed here is that sugar beet is a crop for intensive cultivation, and repays full fertiliser applications. It has also been found that complete dressings of artificials hasten early development, so that singling can be done earlier (Ref. 21). It should be realised that sugar beet should be unhampered in its growth from germination to maturity: any checks to development are bad. The subsidy has encouraged beet growing under conditions of soil and cultivation which are not conducive to the best results. To have a flourishing sugar beet industry high yields are necessary. Growers who are not in a position to come up to the requisite standard had best leave sugar beet growing alone, as they will be forced to do if government assistance is withdrawn.

III.—Virus Diseases.

Economic Importance.

In this country the greatest mischief done by viruses is to the potato crop, where they directly cause such diseases as Leaf Roll, Mosaic, Crinkle, Leaf-Drop-Streak, etc. In addition to these diseases, viruses are responsible for varietal degeneration, or "running out". For many years it was maintained that potato varieties gradually degenerated because they were propagated vegetatively by tubers, and not sexually, by seed. While this is indirectly true, as will be seen later, vegetative propagation is not in itself responsible for the short life of potato varieties.

In addition to these considerations, viruses are responsible for varieties becoming earlier maturing. Now late varieties may appear to be resistant to Blight (*Phytophthora infestans*), but this resistance is due solely to the fact that their lateness makes them too young for maximum infection by the fungus causing Blight. As, however, the variety becomes earlier, due to virus infection, it also becomes correspondingly more susceptible to Blight, and hence viruses are indirectly the cause of increasing Blight susceptibility.

Kenneth Smith (Ref. 26) says that viruses "are of more economic importance than they were even a decade ago", a fact that he attributes mainly to their spread by better transport facilities. There is also the probability that viruses can become adapted to new hosts. The exact harm done by viruses in the case of the potato crop is difficult to assess exactly, but it is estimated by Salaman that the total crop of Great Britain is reduced by about 20 per cent., while in heavily infested stocks there may be a 75 per cent. loss (Ref. 61). Whitehead, working in North Wales, calculates that between 45 per cent. and 55 per cent. of the crop is lost by Leaf Roll (Ref. 29); while Brown and Blackman found that virus-free Scotch tubers yielded on an average 1–2 tons more per acre than locally grown stocks (Ref. 30). Kenneth Smith is of the opinion that Leaf Roll, and the "Y" virus that produces Leaf-Drop-Streak, are the two chief causes of yield losses in this country (Ref. 26).

The potato crop is by no means the sole sufferer in this country. Flower growers know only too well the damage done by viruses. Thus Daffodil and Narcissus bulbs are subject to "Stripe" disease. Tulips again suffer from "breaking", which is a variegation of the petals; in this way, for example, the variety Rembrandt has arisen as a diseased form of the variety Princess Elizabeth. Sweet Peas, Roses, Dahlias, Asters, Irises, and Lilies are garden flowers which are all attacked by viruses. Mention should also be made of tomatoes, sugar beet, tobacco,

hops, cucumbers, vegetable marrows and many other farm and horticultural crops which are subject to more or less serious virus diseases, and there must be enormous losses due to these diseases each year.

It is not here proposed to deal with the virus diseases of all plants of economic importance by describing the symptoms and damage done, etc. As far as we are concerned with viruses in this country, potatoes are our chief consideration, and recent virus research work of economic importance has been largely on potatoes. This discussion will therefore be general in so far as it helps to a clearer understanding of the nature of virus diseases; but special reference will be made to the important work on potato viruses. In the third part of this article, on potato breeding, the picture will be completed by describing the attempts of plant breeders to combat the damage done by viruses.

The Nature of Viruses and Their Physical Properties.

The true nature of viruses is still a matter for speculation, and opinions still differ as to whether they are living or inanimate. Rivers (Ref. 27) concludes that plant viruses are on the border line between life, in its smallest form, and inanimate chemical substances.

Viruses are so minute that ordinary magnifications of the microscope are insufficient for investigators to recognise anything definite as the cause of the symptoms which appear in virus-infected plants. They are, in fact, so small that they can pass through ordinary porcelain filters without coming to any harm. It is, however, impossible to make viruses reproduce themselves outside the tissues of the plant, though some will remain virulent for long periods when kept in the extracted juice of plants.

In some ways viruses, when exposed to different treatments, behave like living organisms. Thus most viruses are rendered inactive if heated to 90°C, though 42°C is sufficient to inactivate some. When juice from infected plants is dried it may be kept, in certain cases, as long as 24 years without injuring the virus, while the mere fact of drying renders others harmless. Exposure to differently coloured lights affects the virulence of some viruses, while short exposure to X-Rays is generally fatal to most.

Symptoms.

Because viruses cannot be recognised by sight they are known solely by the symptoms they produce in the plant they are infecting. There are three types of symptoms—" Mosaics ", which are characterised by leaf mottling; " Stripes " and

"Streaks", where the plant tissue is killed in localised areas; and various distortions of the plant tissues as for example in "Leaf Roll" of potatoes. Symptoms are usually most evident on leaves; but stems, flowers, fruits, and even roots are affected.

Effect of the Host. The symptom picture is complicated by the fact that the same virus can produce different symptoms when infecting different species or varieties of plants. Thus in potatoes the so-called "X" Virus kills the growing points in the varieties Epicure, Arran Crest and King Edward, but produces only a mild mosaic in Arran Victory, and a more pronounced mottling in Up-to-date. (Ref. 26.)

Effect of Environment. Changes in the environment can alter the symptoms produced by some viruses. Thus exposure to high temperatures (above 20°C) causes a complete masking of the symptoms of potato mosaic. Changes in the intensity of light can alter the resistance of the plant to the virus causing tomato "yellows".

Virus Complexes. Further complication in the identification of viruses by their symptoms is caused by "virus complexes", where the symptoms in a plant are caused by the simultaneous action of more than one virus. The symptoms under such conditions may be due to the concerted action of the several viruses, or else one virus may exert a predominant effect. As a general rule two viruses produce more severe symptoms than one acting alone, but sometimes the action of a virus complex is to modify the symptoms of viruses acting by themselves.

From this brief account of symptoms, it will be readily realised why a great deal of confusion has arisen in the description of the action of viruses. Standardisation of symptoms is urgently needed as long as the only means of identification of viruses is by these symptoms. Any description of viruses is worthless unless the name of the infected variety is given. Recent work has shown that the same virus has been described by different workers in totally different terms because of differences in the species or variety of host plant infected by that virus. The importance of this aspect of virus investigation to the grower and the research worker cannot be over-estimated if further elucidation of virus problems is to be expected.

Virus Transmission.

Grafting and Inoculation. All viruses can be transmitted from diseased to healthy plants by grafting, the virus travelling from the diseased to the healthy tissue. In some viruses (*e.g.* infectious chlorosis diseases) this is the only known means

of transmitting the disease. Many viruses (*e.g.* most of the mosaics) can be transmitted by extracting juice from diseased plants and inoculating healthy plants by rubbing it on to the leaves, or scratching with a needle. In one case only (mosaic of lima beans) it has been shown that the virus is transmitted from one generation to the next through the seed, while there are a few cases where it is claimed that the pollen of an infected plant is capable of causing infection of a healthy plant (mosiac of thorn apple).

Insects. By far the most important aspect of virus transmission is in connexion with insects. The methods of transmission referred to above can hardly be responsible for the great amount of transmission that takes place in the field, particularly in the potato crop. It has been definitely proved that certain viruses are transmitted by various sucking insects such as aphides, thrips, leaf hoppers, and white flies, while some biting insects, such as grasshoppers, are concerned to a lesser extent. The aphides (green fly) are by far the most important, one species (*Myzus persicae*) being known to be responsible for the transmission of no less than thirteen separate viruses (Ref. 26).

Aphides appear to cause infection through their saliva. After sucking the sap from a virus-infected leaf, aphides are capable of transmitting the disease to healthy plants when they feed on them. Several considerations point to the conclusion that insects play an essential part in the development of the viruses they transmit. The strongest evidence for this is seen where a varying period of time has to elapse after the insect has fed on an infected plant before it is capable of transmitting the disease. (Refs. 31, 32, 33, and 34). This so-called "incubation period" may be as short as four hours or as long as ten days, according to the insect and the virus concerned.

There are numerous examples of one insect species being wholly and exclusively responsible for the transmission of a particular virus; *e.g.* "curly top" of sugar beet is transmitted only by the leaf hopper *Euttetix tenella.* At the other extreme the insect appears to act in a purely mechanical manner as a transmitter, and many species are capable of transmitting the disease. This is particularly the case with biting insects, which do not appear to have such a close relationship with the virus as do sucking insects.

In certain cases the insect can only act as a transmitting agent if it feeds on the infected plant while in the larval stage, the adult being incapable of transmitting the disease. (Ref. 35). Storey has shown that in some insect species there are "active" and "inactive" strains, only the former being

capable of transmission. (Ref. 36). It should be realised, however, that certain insects have poisonous saliva which produces, quite independent of any virus infection, a diseased condition in leaves on which they feed, *e.g.* "Yellows" in potatoes (Ref. 37).

Field Spread of Viruses.

The importance of the above discussion of the relationship between viruses and insects is in connexion with the spread of viruses in the field. So far as is known, infection from diseased to healthy plants in the field, in such diseases as leaf roll, is due entirely to insects. Infection spreads from diseased plants to healthy plants in adjacent rows, and then in progressively smaller amounts to more distant rows, while there appears to be little danger of the disease spreading to other fields if they are well separated (Refs. 40 and 41).

Whitehead and others (Ref. 38) have studied the relation of aphid population to the amount of some virus diseases in Wales. They conclude that the degree of infestation of potatoes with viruses is not controlled simply by the number of aphides in the locality, but is more dependent on the relation between the date when the aphides are most prevalent and the age of the foliage. Thus when the aphid infestation took place late in the season, the crop was least heavily infected with virus disease. Davies (Ref. 39) found that aphid infestation was at its height in North Wales during mid-July, when 86 per cent. of the potato leaves in the field were harbouring these insects. Where the foliage was prematurely cut down by blight the amount of virus was much reduced.

Thus, as far as the potato crop in this country is concerned, spread of viruses in the field is to a large extent bound up with movement of aphides. The importance of this in connexion with the growing of healthy stocks will be discussed in the next section on Potato Breeding. Control of virus diseases by controlling aphides is at present out of the question. The easiest plan of action is to avoid the aphides by growing potatoes for seed in suitable localities.

IV.—POTATO BREEDING.

General Remarks.

Potato Blight is caused by the fungus *Phytophthora infestans*, and the problem of breeding Blight-resistant varieties has occupied the attention of breeders ever since the catastrophic years of 1845–7, when the disease swept the British Isles. Fortunately spraying the crop offers a fair measure of control for Blight, but the development of resistance to the disease

is the more desirable means of prevention. The other important consideration in potato breeding is the control of virus diseases. This aspect of the work has only sprung into prominence since it has been definitely established that varietal degeneration in the potato is due to virus infestation.

As is now well known, the potato varieties grown in Europe up till about the middle of the 19th century were all derived from two varieties introduced into Europe from South America about the end of the 16th century. These two varieties did not breed true from seed, and were inter-fertile, so that by selfing and hybridisation many new varieties were raised. After the Blight epidemic referred to above, Goodrich in America and Paterson in Scotland turned their attention to this disease and both workers imported new blood from all parts of the world in an endeavour to improve the existing stocks (Ref. 42).

At the beginning of this century further attempts were made to introduce Blight resistance into cultivated varieties by using South American resistant species for hybridisation. Little success attended these efforts, but during the years 1925–8, Russian workers were engaged in searching S. America, which is the home of the potato, for more new forms for breeding work. They have been very successful, and once more breeders are engaged in exploiting this new material, which promises better things than the limited number of forms originally introduced (Ref. 43).

In discussing potato breeding work it is of the utmost importance to realise that potatoes can be propagated vegetatively by means of their tubers. Sexual reproduction and the raising of seed is unnecessary. Thus, although most potato varieties will not breed true from seed, they are quite constant from tubers, and do not vitiate the purity of the stock from the growers' point of view. Once a desirable plant has been selected by the breeder, it can be propagated vegetatively, by its tubers, for an indefinite period, without the trouble of "fixing the type". In Germany, breeders are attempting to raise more or less pure in-bred strains by repeated self-fertilisation. There is a possibility that when these in-bred strains are crossed, stocks which are high-yielding by virtue of hybrid vigour will result. These may then be propagated vegetatively and still retain their high-yielding character, until they become infected with virus disease.

Blight Resistance.

Since the new South American forms have become available to potato breeders a new procedure has been adopted. Com-

mercial varieties with the most desirable economic characters are crossed with South American forms that have the much wanted characters of Blight or frost resistance, etc. Tens of thousands of seedlings have to be raised to find the one or two desirable forms combining all the required characters—a most laborious and expensive process. In Germany a large seed firm has adopted this technique as a part of its regular breeding programme, while breeders in Russia, the United States and England are similarly engaged.

In all the hundreds of thousands of seedlings thus raised, there has been no outstanding success. Blight resistance has been achieved, but at the expense of commercial characters such as yield and cooking quality. It is extremely difficult to combine the character of Blight resistance with earliness and high yield. Back-crossing to the commercial varieties to try and recover the commercial characters results in lowering the Blight resistance. Further, some crosses are very difficult to make because of great differences in genetic constitution, so that the parents have to be chosen most carefully (Refs. 45, 46).

The South American species *Solanum demissum* has been used most extensively by all breeders for obtaining Blight resistance. The Russians are also concerned with the raising of frost-resistant varieties, and by crossing the variety Epicure with a frost resistant S. American species (*S. andigenum*), which is high yielding, they have succeeded in procuring forms with high yield and frost resistance (Refs. 47, 48). In Germany some breeders favour the view that the best way to achieve Blight resistance is to breed varieties that mature too late to allow the fungus to develop fully in the plant (Refs. 50, 51). Races have been raised which show seedling resistance and which are most useful for further breeding. A complication has arisen in Germany in that a new form of the fungus causing Blight has appeared. Strains resistant to the common form of Blight have succumbed to the new form, and it has now been found necessary to breed for resistance to both the forms (Ref. 52). A similar state of affairs has arisen in England, and will be referred to later.

In America, Stuart points out that out of 100,000 seedlings raised, not one variety has been found worth putting on the market, though immunity to Blight has been achieved (Ref. 53). In connexion with this Hardenburg draws attention to the fact that more varieties of economic value have been produced by chance seedlings, from berries formed naturally in the field, than by any other way (Ref. 54). Sterility and incompatibility are great handicaps to the breeder, but Stevenson and Clark have been able to increase the fertility of plants by growing

in greenhouses and supplementing the sunlight with artificial light (Ref. 55).

Now let us turn to this country and see how the fight against Blight is progressing. At Cambridge, Salaman and O'Connor have devised a quick and ready method for testing Blight resistance without planting in the field and waiting for infestation to take place. Seedlings are placed in glass cases in a moist, warm atmosphere suitable to the growth of the fungus. They are then sprayed every day over a period of two to three weeks, with water containing Blight spores. Susceptible strains are killed in five or six days, while immune strains cannot be infected (Refs. 57, 58).

Solanum demissum has been used for hybridisation with commercial varieties. It has taken eleven years to breed out the undesirable characters of this species while still retaining the Blight immunity. Strains have now been raised which are immune to Blight, not only in their foliage, but also in their tubers. This is a unique achievement, and as these immune strains also have reasonably good economic characters, there is every reason to feel hopeful about the future. It may be of interest to mention that the first generation from a *Solanum demissum* cross is—like its commercial variety parent—100 per cent. susceptible to Blight and of good yielding propensities (Ref. 58).

The appearance of a second strain of Blight, to which all hitherto immune stock fell victim, gave cause for some anxiety. As in Germany, it was found that this new Blight strain was not the normal type attacking commercial varieties, and everything succumbed to it. O'Connor, however, has been fortunate enough to find a Peruvian variety which is resistant to this so-called Phytophthora "B". By hybridisation new stocks have been raised which show resistance to both Blight strains (Phytophthora "A" and "B"), and it now remains to try and retain that resistance while improving the quality and yielding capacity.

It can thus be seen that the problem of raising Blight-resistant varieties is still far from being solved. No resistant stocks yet raised can possibly compare with the best commercial varieties from the point of view of quality. Neither the farmer nor the consumer would be pleased with the new stocks as they stand so that at present susceptible stocks still hold in the field.

Virus Control.

Attempts to solve the Virus problem by breeding varieties resistant to the most harmful viruses have met with even less

success than attempts to raise strains resistant to Blight. One isolated case of a new variety resistant to Mild Mosaic is reported from the U.S.A. (Ref. 60). This variety, named Katahdin, was bred by hybridising two seedlings, but its economic worth has yet to be proved.

The breeding of resistant strains is complicated by the fact that the effect of any particular virus depends on the variety of potato that it is attacking. Where the variety is a carrier of the virus there are no outward symptoms, and it is not known to what extent the vigour of the variety is impaired under such conditions. This is seen when the virus causing Paracrinkle attacks the variety King Edward. At the other extreme there is the condition of virulent symptoms being produced with a consequent serious reduction in yield, as when Paracrinkle invades the variety Arran Chief.

Broadly speaking there are two ways of attacking the Virus problem. First, there is the breeding of virus-resistant varieties, which is a most difficult matter and has not yielded any concrete results in this country. Second, there is the easier, though less satisfactory, course of raising virus-free stock. This latter method has been the object of investigation at Cambridge for the last few years (Refs. 59, 61).

It is well known that certain areas of Scotland and Ireland produce the healthiest "seed" potatoes, crops from such seed being comparatively free from virus infection. This appears to be due to the fact that such areas are comparatively free from aphides, or if these do occur they infect the crop too late in the season to do any real harm. Salaman has collected stocks from these localities, and has succeeded in raising twenty-five commercial varieties free from virus by growing them in insect-proof houses. Such a procedure is, of course, uneconomic on a large scale, and the question arises whether it is possible to keep the stocks virus-free when grown on the field scale in England.

Salaman has succeeded in keeping the stocks relatively free in the field by the following means. Potatoes are planted in plots in the middle of growing corn at least half a mile away from the nearest potato field. The plots are never closer than 120 yards to one another, and are of such a size that they can be kept under constant supervision so that sickly plants can be pulled out. Infection under such conditions is rarely more than 1 per cent., and where the infection does occur it is invariably due to the aphid-transmitted "Y" virus which causes mosaic.

By such means it has been found possible to keep stocks after four years as free from virus as the best Scotch "seed". It is suggested that here is a means of growing virus-free stock

in this country. Virus-free stocks could be produced at recognised centres where insect-proof houses are available. Such stocks would then be handed over, for multiplication, to merchants who would grow them under the conditions described above, or in areas known to be suited to the growing of comparatively virus-free stock. Seed-growers' stock should never be more than five years removed from the best virus-free stock. This scheme at least has the merit of doing what breeding work has up to the present failed to accomplish, and it offers the possibility of comparatively virus-free stock as soon as such a scheme could be organised.

The work of Whitehead and others in Wales already referred to (Ref. 38), has shown that "seed" potatoes reasonably free from virus infection can be produced in North Wales. Successful centres are characterised by being three to four miles from a bleak and exposed sea coast; the farming in the locality is chiefly pastoral, with small potato fields relatively far apart; and the prevailing wind is from the sea, a fact which seems to cause premature ripening of the crops. As has been pointed out earlier, premature ripening and early Blight attacks appear to have the same effect on the tubers by keeping them relatively free from virus infection.

Until virus-free stock is available for the grower, Salaman (Ref. 63) suggests that the following rules of cultivation should be practised to help to keep virus diseases in check :—

1. "Never plant two different varieties in the same field or in close proximity to each other". The object of this is of course to avoid spread from variety to variety. It is of particular importance where a variety such as King Edward is being grown, as it is a "carrier", and though apparently healthy is capable of infecting neighbouring crops with Paracrinkle.

2. "Clean cultivation is essential". Tubers left in the ground may be ready sources of infection to the next potato crop, so that, if possible, it is advisable not to grow potatoes on the same field for two consecutive years.

3. "Maintain wide, clean headlands, and cut all banks and hedgerows". This is important because plants in hedgerows, etc., harbour insects which may be instrumental in virus transmission, while Black Nightshade and Bittersweet may act as carriers.

To the above golden rules perhaps may be added the importance of keeping the stock healthy and virus free when the tubers are being stored. Aphides can remain alive on the tubers through the winter, and when the sprouts appear in the spring they can multiply rapidly. The importance

of this must be stressed because the plant is probably more readily infected by viruses when the sprouts are just growing than at any other time, and considerable infection must take place when the plants are in this condition. At the Potato Virus Research Station, at Cambridge, stored tubers are fumigated with nicotine twice a week throughout the year. This has proved very effective in preventing the spread of virus diseases (Ref. 64).

Variety Trials.

Every grower is primarily interested in the yielding capacity of the varieties of crops he grows, and yield trials have become a recognised part of the routine work of most experimental stations. The testing of the yielding abilities of varieties requires more careful handling with the potato than it does with other crops, and yield trial results with potatoes should be accepted with special caution.

The reason for this is bound up with the question of "seed" in potatoes in contra-distinction to the true, sexually produced, seed of other crops. The "seed" tubers of the potato are much affected by complicating factors that determine the resultant yield. The most important consideration is of course the degree of virus infection. As it is impossible to use tubers that are equally infested with virus (because it is impossible to assess this with sufficient accuracy) the only reliable yield figures are those obtained with virus-free stocks (Ref. 65). Again, the vitality and yielding capacity of tubers is greatly affected by the conditions of growth and harvesting of these tubers. Thus immature "seed" yields better than fully mature "seed", and large sets give a smaller percentage of ware than small sets.

The National Institute of Agricultural Botany has conducted yield trials with potatoes for several years at Ormskirk, Kirton, and Truro. The full results of these trials cannot be given here, but the most important findings are briefly given below. (For further details see Refs. 64, 65, 66.)

Arran Crest is the best of the First Earlies, in respect of total yield and yield of ware. Epicure is the next highest yielder, but its percentage of ware is not as high as that of Arran Crest. Immune Ashleaf was the poorest variety in the First-early trial from the point of view both of total yield and of ware yield. Of the Second Earlies, King George was the highest yielder.

The Maincrop and Late varieties of course vary a great deal in the time of maturity, there being, on the average, about 31 days' difference between the earliest, Ally, and the latest, Kerr's Pink, Rhoderic Dhu, and Incomer. The heaviest yielders in

this group are Arran Banner, Kerr's Pink, and Majestic. Kerr's Pink was generally found to be the supreme cropper in these trials, but Arran Banner may outyield it, though its ware percentage tends to be low. The high yield of Majestic is offset, from the economic point of view, by the somewhat flavourless character of its tubers. King Edward does not yield like the three varieties mentioned above, and there is evidence that its yield is falling off. For a garden potato there is still no variety that can approach the quality of Golden Wonder, but its yield is of course too small for an ordinary field crop.

In practice, of course, every grower has to discover for himself the most remunerative variety for his particular conditions, and yield is not the only factor to be taken into consideration. The yield-trial results referred to above should, however, serve as a useful basis for selection of the best varieties.

V.—The Question of Synonymity.

New Varieties.

After a discussion of the problems facing the potato breeder, it may not be out of place to refer to the vexed question of varietal synonyms ; for, of all crops, the potato is notorious in this connexion. At the present moment there are too many varieties of every crop ; whether it be a cereal, potatoes, swedes, turnips, or mangolds. The agriculture of this country does not require such a profusion of varieties, which merely leads to confusion and misunderstanding. Further, the position is being constantly aggravated by new additions of unknown worth.

Unfortunately extravagant claims are too often made by the sponsors of a new variety when it is being offered to the farmer. Very occasionally a variety can live up to its ready-made reputation : more often it suffers because of it. Every man likes his own child best, and is apt to be blind to its faults. In such a case it is as well to have an unbiased opinion, and a farmer would be well advised not to purchase large amounts of expensive seed of new varieties until he has consulted the National Institute of Agricultural Botany, whose function it is to test new varieties, or his local Experiment Station.

No one will dispute that there are redundant and superfluous varieties on the market which would be best out of the way. It would be much more satisfactory to the grower to have at his disposal a mere fraction of the present number of varieties. This object could be gained without taking away anything of value, and the knowledge of the chosen varieties could be made avilable to all. There are numerous varieties

advertised which, to all practical and economic purposes, exist merely as names. The country would be better without them. The only sufficient excuse for putting a new variety on the market is that the said variety is either definitely superior, in some character of economic importance, to the varieties already available, or is specially adapted to conditions for which there are no suitable varieties in existence. The mere fact that a new introduction is possessed of some unimportant botanical difference from the varieties already being grown should give it no claim to be offered to the farmer as a new variety. The desire for possessing something new is strong in all human beings, but as a general rule indulgence of this desire is expensive and often unprofitable.

It cannot be too strongly emphasised that real improvements in an old agriculture, such as that of this country, are difficult to achieve. This is particularly true in the production of new, superior, varieties of crops. Putting aside the possibility of spotting a ready-made winner, which happens but rarely, the breeding of improved varieties is a slow and arduous task and there is no short cut. Even when the breeder feels satisfied that he has made a definite improvement, confirmation in the form of field trials extending over a number of years is always necessary.

But by far the most undesirable practice, in the search for something new with which to attract the grower, is the re-naming of old varieties. Any strongly established favourite is liable to appear on the market with a new name, and new and attractive attributes. This method of producing "new" varieties is highly remunerative, as of course higher prices are demanded for the seed. Varieties which are identical in all respects, except name, are termed synonymous, and it is proposed to give a few concrete examples of synonymity in potatoes and cereals.

Potatoes.

As was stated above, the potato crop has been most extensively exploited for the production of synonymous varieties. As long ago as 1916 the Royal Horticultural Society made the first move to stop the practice, and for 18 years the National Institute of Agricultural Botany has been engaged in a detailed examination of all varieties in an endeavour to isolate the spurious ones. In 1919, 75 per cent. of the varieties examined at Ormskirk were found to be synonymous. In 1925 this figure had dropped to 16 per cent., while in 1931 it sank to 6·3 per cent., which is the lowest figure yet obtained (Ref. 67). Salaman calculated in 1926 that there were some 1,500 synonyms associated with the 500 or so varieties that had been

put on the market in the 50 years previous to that date. A popular variety such as Up-to-Date was found to have as many as 200 synonyms, while many other well known varieties had proved very prolific in synonymous productions.

The results of the 18 years' work of the Potato Synonym Committee have been recently revised and brought up to date (Ref. 68). A list of the common potato varieties in cultivation is given, with their reaction to Wart disease and their synonyms. Varieties which have arisen as "sports", and which possess no special character of economic importance, are regarded as synonyms of the parental form from which they arose. Thus the variety Sefton Wonder is a russet-skinned synonym of the variety Great Scott. On the other hand, where a new variety has arisen, which differs from its parent in an important character such as Wart disease reaction, and is similar in all other respects, it is allowed to stand as a distinct and new variety. Such a compilation of varieties should be of great value to potato growers, and copies are available to all those interested.

Cereals.

In 1932, the Cereal Synonym Committee appointed by the R.A.S.E., the N.I.A.B., the N.F.U., and National Association of Corn and Agricultural Merchants, published the first list of cereal synonyms (Ref. 69). This was followed in 1933 by a shorter list (Ref. 70). The lists show, particularly in the case of wheat and oats, that many new varieties put on the market in recent years are synonymous with some of the best known and most popular varieties already being grown. Thus Squarehead's Master, Wilhelmina, and White Marvel each had two new varieties which were synonymous with them. In oats, Abundance was found to have seven synonyms, while two "new" varieties were found to be mixtures of Black Winter and Bountiful.

These examples could be multiplied many times, but it would serve no useful purpose. Other crops are in a similarly undesirable state. Many farmers are now embarking on the growing of horticultural crops, and the maze of varieties, to anyone unfamiliar with a particular crop, prevents any intelligent selection of the most suitable types to grow. Even if the varieties are not absolutely synonymous, the differences are in many cases so slight that any grower could well afford to neglect them. It cannot be too strongly emphasised that a new name does not necessarily mean a new variety of distinct or improved economic worth. It might easily happen that changing a variety three or four times would give substantially the same results to a farmer, and while varietal differences

are of such an order there is bound to be ample scope for placing innumerable worthless varieties on the market.

It is therefore worth stressing the importance of using great circumspection in the choice of varieties if disappointments are to be avoided. Judgement as to the worth of new varieties rests finally with the farmer, but preliminary indications of the possibilities of a variety should first be obtained from properly conducted trials. The growing of untried or new varieties is a gamble which more often than not leaves the farmer a poor loser.

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DISEASES OF ANIMALS: PREVENTION AND TREATMENT.

I.—SWINE FEVER.

Survival of the Virus within Pig Carcases.

The length of time during which viruses of the filterable class—of which those of swine fever and foot-and-mouth disease are examples—remain alive is governed by a number of conditions, among which the surrounding temperature and the growth of ordinary bacteria are of great importance. A relatively low temperature is favourable to survival, not only directly but also indirectly because it interferes with multiplication of bacteria which, especially when they are of a kind which produce putrefaction, are detrimental to the vitality of viruses. A recent observation by Blaizot in France (Ref. 1) may be quoted in illustration. He found that when ground-up tissue (*e.g.* from spleen and kidney of a pig which has died of swine fever) is mixed with saline and glycerine in certain proportions and stored at about 27°F below freezing, the virus may remain alive and fully active for more than 5 years. In such a case prolonged survival is due not only to the very low temperature and absence of putrefaction, but is also probably assisted in a certain way by the glycerine. On the other hand, it is known that when a dead body putrefies in a natural way the swine fever virus in the internal organs becomes inactive in as short a period as 3 or 4 days.

Within recent years much interest has been aroused by the finding that viruses, *e.g.* those of foot-and-mouth disease and swine fever, may remain alive for a considerable time in carcases

prepared for human food. In both these diseases there is an early stage at which obvious symptoms have not yet developed but at which large quantities of virus are already present in the body. If, therefore, animals are butchered at this stage, the virus can be transported for long distances in the chilled, or otherwise treated, carcases, and residues from such carcases, if used for pig feeding in the uncooked state, become a source of danger to other susceptible animals. In the case of swine fever, observations on this point have been made in the United States by Birch (Ref. 2), in Germany by Zeller and Beller (Ref. 3), and recently in this country by Doyle (Ref. 4) at the Veterinary Laboratory of the Ministry of Agriculture. Birch seems to have been the first to show by experimental means that the virus survives the trade processes of chilling and curing. He found that ham which had been cured for 6 weeks and then stored for 80 days still contained living virus. In the experiments of Zeller and Beller the virus used was probably highly active, the material to be tested being taken from pigs which showed on *post-mortem* examination the changes characteristic of extremely acute swine fever. Pieces not over 5 lb. in weight, cut from the fore or hind limbs, were packed in salt or immersed in a pickle containing 25 per cent. brine and stored in a cold room. At intervals, portions were removed, washed, minced and fed to pigs twice daily for 2 to 5 days, the total consumed by each animal varying from about 1 to 10 lb. In these circumstances, living virus was proved to have remained in salted pork for at least 315 days and in pickled pork for at least 181 days. The pickle itself was also fed, and proved to contain virus for as long as 42 days. Livers from pigs with swine fever were frozen and, in these, virus was proved to survive up to 149 days. In Doyle's experiments, pigs were artificially infected and were killed when they were feverish, or at a more advanced stage when definite symptoms had developed. Some of the carcases were "chilled", *i.e.* kept at a temperature of about 26°F ; others were "dry-salted", *i.e.* they were rubbed with powdered salt, placed in salt for 4 days at ordinary temperature and then put in cold store at a temperature of 30° to 34°F. Others again were smoked, *i.e.* after being salted as before for 4 days they were washed with hot water and "smoked" under trade conditions. It may be noted that the highest temperature reached in any part of the carcase during the process of smoking was 85°F. At intervals, tests were made by feeding some of the flesh after mincing, or one or two of the long bones were fed after crushing—it being known that virus is especially well preserved in the bone marrow. The results were that the virus remained alive for at least 73 days in the bone marrow of both chilled and dry-

salted carcases of pigs killed at the stage of fever. In the skin and muscle of the salted carcases of two pigs, killed when they were visibly ill, living virus was certainly present after 42 days and some was probably still present after 76 days. In similar tissues from pigs killed when feverish the amounts of virus present were small and only traces could be detected after 17 days, when the experiment was discontinued. In the bone marrow and muscle of two smoked carcases the virus lived for at least 37 days. It was clear, therefore, that smoking had no appreciable effect in destroying the virus.

The results of these three series of experiments, therefore, agree in showing considerable periods of survival of swine fever virus in meat products under trade conditions of preservation.

Survival of the Virus Outside the Body.

Pigs with swine fever excrete the virus by the urine and faeces and also in the secretions from the eyes and nose. The chances of the surroundings becoming dangerously contaminated are increased by the fact that in acute cases slight haemorrhages may take place from the bowels and from the skin. The possibility of the disease being spread by contaminated manure, and of fresh outbreaks arising through susceptible pigs being placed in sties or railway trucks which had been occupied by diseased pigs, naturally attracted early attention. It was anticipated that the danger in this respect might be considerable. The work of the English Departmental Committee on Swine Fever (1915) showed, however, that the risk from sources such as these was not very great, apparently because of the low resistance of the virus to putrefaction. Workers in the United States and in Germany came to similar conclusions. Thus, while pigs can be infected by feeding them on manure immediately after it has been collected from diseased pigs, storage of the manure under ordinary conditions for a day or two renders it non-infective. Similarly, while sties which have been occupied by sick pigs are dangerous to healthy pigs which are allowed immediate access to them, the risk is small if the sties are left vacant for more than two or three days. On one occasion only in the English experiments was a sty found to be infective for as long as seven days. These findings are in accordance with experience of outbreaks in this country, which shows, as pointed out by Jackson and Cabot (Ref. 5) that new outbreaks rarely occur on previously infected premises under circumstances suggesting survival of virus from the previous outbreak.

Recently, at the German Research Station on the Island of Riems, David (Ref. 6) has carried out further experiments

in an endeavour to obtain more exact information on certain points, particularly with regard to the effect of desiccation upon virus excreted from the body. His observations confirmed the earlier work in showing that the disease is not always transmitted to healthy pigs when these are put in sties vacated by infected ones, even when there elapses a period of only 24 hours. He also found that the urine of sick pigs is not regularly infective, even at a time when the pigs are feverish and have, therefore, virus circulating in their blood. When the urine does contain virus, its infectivity is lost within 48 hours at summer temperatures, even under conditions of storage more favourable for survival than would be met with in practice, where the urine is mixed with the manure. Stored blood retains its virulence longer than stored urine, *e.g.*, for as long as 10 to 15 days at summer temperatures when putrefaction is somewhat rapid. When putrefaction is retarded, blood may remain virulent for as long as 50 days. In blood mixed with pig dung, *i.e.*, under conditions such as might occur in practice, the virulence was maintained at summer temperature for 40 but not for 90 hours. Similarly, when mixed with garden earth, blood remained virulent for seven days, but not for 13 days, at summer temperatures. David found that when material containing the virus is dried, it may remain infective for at least 40 days, especially if the material contains much protein, as is the case with blood. In fact, he suggests that the resistance of the virus to desiccation may be made use of in practice, *e.g.*, by drying, on strips of filter-paper, blood which has to be transported for long distances for the purpose of artificial immunisation, or when suspected material has to be sent to a laboratory for diagnosis. At the same time, the resistance of virus to drying shows the importance, in disinfection, of paying greater attention to parts where the virus can become dried (*e.g.*, the walls of sties) than to places where it is likely to be mixed with dung.

Disinfection.

Although putrefaction has a rapidly destructive effect upon the virus, the fact that the virus is somewhat resistant to desiccation indicates the importance that should be attached to measures of disinfection. Within recent years research has been devoted to finding chemical agents suitable for killing viruses. This has shown that alkalis such as caustic soda are particularly effective, and their use in practice is, therefore, warranted. Caustic soda in a strength of 1 or 2 per cent. is remarkably effective, for instance, against the virus of foot-and-mouth disease, and it has been shown in Germany by Miessner and Geiger (Ref. 7) and by David (Ref. 8) that it has a similar

action against the virus of swine fever. The high disinfectant value of caustic soda, particularly when mixed with lime, for swine fever virus, has also been shown by Helm and Wedemann (Ref. 9) in their work at the veterinary Division of the Imperial Health Office in Berlin. These authors have recently reported an extensive series of experiments dealing with the practical aspect of the subject. The experiments were carried out by means of two railway trucks, into each of which 3 or 4 pigs were introduced. These were artificially infected by injecting them with virulent blood and then left until, by the death or extreme sickness of some or all of them, it could be assumed that the trucks were heavily contaminated. Straw bedding was not provided, except a very little in the winter months, as this was found to prevent soiling of the walls and so interfered with the subsequent course of the experiment. After the dead or ailing pigs had been removed, one truck was carefully cleaned and disinfected according to the method under trial, while the other, or control truck, was roughly cleaned with a brush ; three or four healthy pigs were then placed in each. In order that accidental infection might be avoided, special precautions were taken against possible introduction of the disease by attendants or by fodder. Both sets of animals were observed for at least 14 days from the time when the controls began to sicken. If the animals in the truck which had been treated with disinfectant, did not sicken, they were later tested with virus to make sure they were still susceptible. In the experiments, caustic soda, of 1 or 2 per cent. strength and with or without the addition of slaked lime, was subjected to test for periods varying from 1 to 24 hours. The mixture was applied with a spray, unheated and in amount sufficient to give good impregnation. The addition of lime has the advantage not only that it increases the disinfectant action of the soda, but also that it enables the operator to make sure that the disinfectant has been applied to all parts. As is to be expected in work of this sort, the experiment did not always proceed according to plan. Thus, in some of the cases the animals in the undisinfected truck did not sicken, although some of them on test were subsequently found to be immune. This was considered to be due to unequal contamination of the trucks, partly because some of the artificially infected pigs died quite early and before they had had time to excrete much virus. In one case the pigs in the control truck remained healthy, while those in the truck which it was intended to disinfect got swine fever. Thus, although 15 experiments were carried out, 9 alone gave conclusive results and in only 6 of these were caustic soda and lime used together. It is pointed out that the thoroughness with which trucks can be cleaned and disinfected

is largely dependent on the weather. Thus, in dry, hot weather or at freezing temperatures cleaning was a more difficult task than when the weather was mild and moist. The experiments showed that at summer temperature the virus was killed in 1 hour by a mixture of 2 per cent. caustic soda and 1 or 5 per cent. lime, while at freezing temperature the virus was not killed in 2 out of 3 experiments by a mixture of 2 per cent. soda and 5 per cent. lime, even after 24 hours' exposure. At intermediate temperatures, 2 per cent. soda and 5 per cent. lime was effective within 24 hours. The disinfectant action of 2 per cent. caustic soda and 5 per cent. lime is thus held to be reliable, except when the weather is very cold. In the latter case, presumably, it would be an advantage to repeat the cleaning and disinfection.

It may occur to the reader to ask why the two trucks in each experiment were treated differently in the matter of cleaning. The control truck was merely intended to show that the virus, liberated into the trucks by the diseased animals, was in a fully active state. Thorough cleaning of the control truck was, therefore, avoided and it was simply swept out with a brush. It was clearly shown, however, in four experiments, that even thorough cleaning-out of trucks may not always be sufficient to eliminate infection from them, since in spite of the cleaning and attempted disinfection the pigs placed in the trucks contracted swine fever.

II.—Survival of Tubercle Bacilli on Pasture.

One of the characteristics of a contagious disease, of which tuberculosis is an example, is that the causal organism is capable of multiplying only within the living body. In considering the control of contagious diseases, the greatest importance is rightly attached to the elimination of diseased animals, so that infection of healthy ones may be prevented. By itself, however, this measure may not succeed, because the organisms may survive long enough outside the body to cause infection of healthy animals which come in contact with them. It is, therefore, of great importance to find out how long the organisms can survive in the exterior under practical conditions. Now it is known that tuberculous cattle sometimes excrete the organism with their dung and so contaminate pastures and water supplies, and for this reason attempts have been made to find out the greatest length of time pastures may remain infective. Experiments with this object have been conducted during recent years at the National Institute for Research in Dairying at Reading. The late Dr. Stenhouse Williams and W. A. Hoy set out to find, in the first place, to what extent

apparently healthy cattle excrete tubercle bacilli in their dung. In 1927 (Ref. 10) they reported upon the examination of 391 samples of dung from as many apparently healthy cattle living in 5 counties in England and Wales. As a result, it was found that only 6 (1·5 per cent.) of the samples were infective according to the most sensitive test available, *viz.*, the inoculation of guinea-pigs. Unfortunately, it was not known precisely what proportion of the 391 cattle were tuberculous since only 24 of them had been tested with tuberculin. It may be assumed, however, that a considerable number of the cattle were tuberculous. In actual fact, none of the 24 animals known to be tuberculous was found to be excreting tubercle bacilli at the time of examination.

A more intensive examination of 3 of the 6 animals was reported in 1928 (Ref. 11). Out of 185 samples of dung taken at intervals during the time when they were still apparently healthy, 35 (18 per cent.) were positive. This result appeared to show that excretion by the intestine is intermittent, even with cows in a relatively advanced stage of the disease. In connexion with this conclusion, however, as the authors pointed out, it must be remembered that the method of search is very imperfect, since only about 1 oz. of the daily output of dung can be examined. Also, since the contamination of intestinal contents is due to the swallowing of mucus coughed up from the lungs, the distribution of tubercle bacilli in the digestive tract must obviously be very irregular. This work, however, made it clear that, in experiments designed to test the survival of tubercle bacilli on pasture, naturally infected cow-dung would not be suitable. Experiments were, therefore, carried out (Ref. 12) in which dung was contaminated artificially by adding to it finely ground up tissues from the tuberculous lungs of cattle. This was chosen because it most nearly approached the kind of material that would be found in dung under natural conditions. The contaminated dung was then placed on pasture in the form of cow droppings, and was covered with a wire frame ; at intervals portions were removed for inoculating guinea-pigs. Under these conditions the longest periods over which living tubercle bacilli could be detected were 5 months in the winter, 2 months in the spring and less than 2 months in the summer. Some of the pads were protected from rain and direct sunlight, and as far as possible from worm and insect life ; survival was then a little longer, namely 6 months in autumn and 4 months in summer. The results showed that the duration of infectivity was related to the length of time that faecal matter was still discernible. For the purpose of comparison, some of the contaminated dung was kept in pots in the ground and in this material tubercle bacilli were found

to survive for at least 2 years. Even in a suitable sample of naturally infected dung stored under these conditions, the organisms were found to be alive after 12 months.

Work of this nature on somewhat modified lines has been continued at the National Institute for Research in Dairying by Maddock (Ref. 13) since 1931. In the first place, the survival of tubercle bacilli in soil, in cow dung and in mixtures of the two, was studied. For this purpose 5 porous pots, 15 inches in diameter, without bottoms, were sunk into the soil to ground level. Inside each of these a second pot, 12 inches in diameter, also without bottom, was sunk until its upper rim was level with the ground. The space between the two pots, as well as the inner pot, was then filled with soil. The object of this arrangement was to prevent the entrance of insects and burrowing animals without interfering with soil drainage and aeration. That the arrangement was successful in this respect was shown by an examination of the soil in the pots after a preliminary test period of 3 months. At the beginning of June a portion of the soil in each pot was removed. In the first pot this was replaced by soil, in a second by cow dung and in the three other pots by a mixture of soil and cow dung in varying proportion. In each case the material added to the pots had been artificially contaminated with tubercle bacilli obtained, as in the experiments of Williams and Hoy, from tuberculous ox lung, and it was filled into the pots so as to form a surface layer about 3 inches deep. The ground where the pots were situated was then covered with a wire frame to keep out birds. At about fortnightly intervals, for a period of 245 days, about 3 oz. from the surface layer in each pot were removed and tests were made on guinea-pigs to see whether any tubercle bacilli remained alive. Before inoculating the animals, however, the soil was treated with a chlorine disinfectant in a strength which previous experiments had shown to be satisfactory for killing many of the bacteria normally present in soil and cow dung, but insufficient to kill tubercle bacilli. Precautions of this sort were necessary, because the numerous bacteria in soil or dung may be fatal to guinea-pigs before any tubercle bacilli present have had time to produce their effects. The necessity for such precautions had been fully realised by Williams and Hoy, but these workers had not been very successful in preventing premature deaths among their guinea-pigs. Maddock paid much attention to the point in the hope that more exact information might be obtained as to the survival of tubercle bacilli. His results showed that even during the summer, under the conditions of the work, some tubercle bacilli can survive an exposure of 6 months, while at and after the seventh month all were dead. The pot containing dung only was positive at

every test, suggesting that survival is favoured by large amounts of organic matter.

The next stage was to see how long tubercle bacilli would survive on growing grass, since the final object of the experiment was to see how long pastures previously occupied by infected cattle should be left vacant before fresh cattle are turned on to graze. For this purpose suspensions containing different numbers of tubercle bacilli were prepared as before by grinding up tuberculous ox lung and spraying on to three grass plots, each 50 feet square. At intervals the grass was removed from 1 sq. ft. of each plot, great care being taken to avoid any admixture with soil, and washings therefrom were tested. The experiment was begun in April. At the beginning there was a heavy rainfall, which was followed by a period of great heat and dryness. In spite of this, living tubercle bacilli were still present on the grass of the most heavily contaminated plot after 49 days. In another experiment (unpublished observation), tubercle bacilli were proved to be alive after 63 days.

The experiments outlined permit some conclusion on the main point at issue, *viz.*, how long pastures are liable to remain contaminated with living tubercle bacilli. It is well known among bacteriologists that the tubercle bacillus is a relatively hardy organism and the observation of Williams and Hoy that tubercle bacilli were still alive after 2 years' immersion in cow dung proves how extremely resistant they are to putrefaction. The indications, however, are that on pasture—in the south of England at any rate—the organisms do not remain alive for more than about 6 months in the summer, though perhaps during the winter they may survive rather longer. What the chances are of healthy cattle becoming infected by grazing on contaminated land is for the moment a matter of conjecture and one that requires investigation. Pending further information on this point and taking the chances into consideration, there is at present justification for recommending that pastures which have been inhabited by tuberculous cattle should be allowed to remain vacant for at least a full autumn and winter or for the spring and summer months. If it is possible to leave them vacant longer than this, say for 10 to 12 months, the risk becomes still more remote.

III.—Mastitis in Cattle.

The subject of mastitis is a vast one and it is not possible in a single article to deal with it adequately. It is proposed, therefore, to give here a general review of the present position

and in subsequent articles to refer in greater detail to the more practical aspects of the problem.

Definition.

The word "mastitis" means literally "inflammation of the mammary gland" and it may be regarded as corresponding to the popular term "garget". Ordinarily however, the term "garget" is used in a restricted sense to indicate cases where the udder is obviously inflamed and where there are well-marked changes in the milk. In reality, the word "mastitis" signifies much more than this and includes all types of infection of the udder, irrespective of their severity. Actually, in very many cases of mastitis at any given moment, the alterations in the gland are so slight or indefinite, and the milk is so little altered in appearance, that examination of the milk by special methods is the only reliable means of revealing abnormalities in it. It is important to realise, however, that such hidden infections cannot be excluded from consideration, not only because proper methods *do* reveal the presence of infection, but also because sooner or later such cases usually pass into an acute and easily recognisable stage. Moreover, such hidden cases may act as the starting-points of attacks which are clinically evident in other cows, and which, therefore, fall within the category of "garget". As used in this article, therefore, it must be understood that the term "mastitis" refers to all cases of udder inflammation whether readily apparent or not.

Causes of Mastitis and the Various Forms of the Disease.

It is necessary to distinguish *actual* causes from so-called predisposing causes. The reason for making this distinction will become apparent in the account which follows.

Actual Causes. At the present day it is accepted that inflammatory changes in the udder originate as a direct result of the activities of bacteria. These bacteria belong to quite different kinds and it is for this reason largely that different forms of the disease are met with. In order that there may be no confusion, however, it is necessary that some system of classification should be adopted. Thus, cases may be spoken of as acute or chronic according to the course taken by the disease; as gangrenous, purulent, etc., to indicate the kind of reaction set up in the gland. For certain reasons, however, such descriptions are not very satisfactory and the most useful method of classification is one based on the kind of micro-organism responsible for the attack.

It is now well known that the great majority of cases of the disease which occurs in cows in milk are essentially of a

chronic nature and are caused by small spherical bacteria which grow in chains and which are known as *streptococci*. Occasionally there is seen a form of mastitis due to a somewhat similar group of organisms which grow in irregular clumps instead of in chains and which are known as *staphylococci*. This form is acute and distinguished by a tendency to gangrene or putrefaction of the affected parts. Still other organisms, including *Bacillus coli* and the bacillus of tuberculosis are occasionally the cause of mastitis in cattle. Finally, there is a form of mastitis which chiefly attacks cows during their dry periods and which is caused by an entirely different variety of micro-organism, known as *Bacillus pyogenes*. Owing to the facts that this form chiefly appears during the summer months among cattle at pasture, and that several animals are often affected at the same time, this form is usually spoken of as "summer mastitis" or "epidemic mastitis".

Predisposing Causes are factors which render animals more liable to an attack. Among such may be mentioned any which cause damage to the milk-secreting tissues—such as stagnation of milk within the udder following incomplete milking, or the practice of "overstocking". Direct injuries to the gland act as predisposing causes, *e.g.*, those caused by rough milking, by the teeth of the calf during suckling or by treading or goring of the udder. Similarly, what may be called climatic agencies are of importance, *e.g.*, chills from lying on cold, wet flooring and from draughts. Finally, there are agencies which tend to lower the general bodily resistance, *e.g.*, the act of calving, and the many diseased conditions to which cattle are subject. Before the days of bacteriology it was natural to suppose that factors such as these were the actual causes, but it is now clear that predisposing causes are subsidiary in the sense that they are unable to exert their full effect in the absence of disease-producing bacteria.

Many of the observations which have been made, in the past, on the influence of predisposing causes in setting up mastitis are of small value because it is not certain that the animals were healthy at the start. In this connexion mention may be made of an experiment, which was free from this objection, conducted at the Research Institute of the Royal Veterinary College, London, from December 1930 to March 1932 (Ref. 14). In this experiment two groups of cows, comprising about 160 animals and known to have healthy udders, were placed for a period of 15 months on concrete and on cork-brick standings respectively. A minimum amount of bedding was provided. During the period 26 cases of mastitis developed, of which 15 occurred in cows standing on concrete and 11 in cows on cork-brick. This result cannot be held to indicate that a cold

flooring such as concrete is an important predisposing factor in producing the disease.

Symptoms of Mastitis.

Symptoms vary with the form of the disease.

The *streptococcus form of mastitis* which occurs so commonly among cows in milk—and particularly among older cows—is essentially chronic and insidious in its course. Active symptoms are often not prominent. Nevertheless there is, as a rule, progressive destruction of the milk-secreting tissues and, as a final result, a " light quarter " or complete functional loss of a quarter. At the same time the affected portions of the gland acquire a firm consistency, the hardening involving sometimes a whole quarter or being sometimes confined to smaller areas, so that on handling the quarter feels " lumpy ". One, two, three or even all four quarters may be affected at the same time. During the stages of the disease at which the symptoms are more quiescent, the characters of the milk may be unchanged to the naked eye or it may contain only small clots and these may even be confined to the first few streams drawn. From time to time more active signs of inflammation may be expected to appear. In a typical case the udder is then swollen, hot and painful, and the characters of the milk are markedly altered, the secretion consisting of a whey-like liquid in which float curdled masses. With frequent and thorough stripping out these signs are likely to disappear and in a few days the milk is likely to regain its normal appearance. For the reason just mentioned, and also on account of the apparently mild nature of the affection and of the slight disturbance to the animal's general health, some are under the erroneous impression that the disease is of small importance. This is unfortunate because, apart from other reasons to be mentioned later, it is now well recognised that infected cows usually carry the infection over several lactation periods and rarely show complete recovery.

In young cows or first-calf heifers a less common form of streptococcus mastitis is sometimes seen a few days after calving. In this form acute symptoms are present from the outset, often in one quarter only, which is rapidly destroyed and sometimes almost entirely disappears. It has only recently become clear that the streptococcus which causes this more acute form is different from that which causes the chronic form. This means in effect that the chronic and the acute forms represent distinct diseases, a discovery which is of importance because, according to present knowledge, control measures in the two cases must be different. An account of a herd in which the more acute disease presented a serious problem was published in 1932 by Minett, Stableforth and Edwards (Ref. 15).

The *staphylococcus form of the disease* is relatively uncommon and occurs in cows very shortly after calving. Frequently the result is death from gangrene of the udder; if recovery does ensue it is usually at the expense of sloughing out of the parts affected.

Tuberculous mastitis is a chronic affection of the udder, generally commencing in the upper portion of the back quarters. The disease is slowly progressive, gradually extending within the gland and leading to enlargement and to hardening of a diffuse character. The milk in the early stages is unaltered in appearance, only later becoming whey-like and containing clotted material.

In *summer mastitis* which, as previously mentioned, is seen chiefly in dry cows and maiden heifers, the disease is suppurative in nature, abscesses forming in various parts of the gland and sometimes breaking outwardly through the skin. The quarters affected are as a rule completely lost and the animals themselves often fall away greatly in condition.

Economic Importance.

Of all the forms of mastitis, the main streptococcus form is of the greatest importance to agriculture, not only on account of its chronic and, to all intents, incurable nature, but also because of its wide prevalence. In connexion with the latter point, the matter unfortunately is worse than appears on the surface owing to the high proportion of hidden cases, to which reference was made in the introduction. Indeed, in a great many herds it has been found by examination of the milk of individual cows that not less than 35 to 40 per cent. are infected in at least one quarter of the udder, the majority of these being hidden cases. On consideration, such a high incidence is to be expected, since everything points to the conclusion that infection is spread by the hands of the milkers, who often have no means of discovering which cows are infected. The main effect of the disease in the individual animal is to cause a reduction in the milk yield, so that cows gradually become more and more unprofitable. At the same time there is a deterioration in the quality of milk, which becomes poorer in fat and sugar and comes to contain the products of inflammatory reaction or even pus.

Control.

Here again we are chiefly concerned with chronic streptococcus mastitis. Unfortunately, at the present time there is no evidence that more than a small minority of cases will respond to the injection of vaccines or to treatment by chemical

substances. Control, therefore, must be carried out in another way, namely by preventing healthy animals becoming infected. In the first place, efforts should be made to avoid the predisposing causes mentioned above. With mastitis, as is so commonly the case with other contagious diseases, the animal suffering from the hidden kind of infection is of outstanding importance. Unless such animals can be recognised and suitably dealt with, real progress in suppressing the disease will not be achieved. It has been pointed out that mere inspection of the milk or handling of the udder is frequently ineffective. There are available, however, methods which are of value for diagnosis, and these consist either in testing the milk for the products of inflammatory reaction or in examining it for streptococci. In the former case, a thin layer of the milk may be drawn into a shallow glass dish and inspected for clots, or its chemical reaction may be tested since in mastitis the milk sometimes becomes abnormally alkaline ; or, finally, a little milk may be separated or centrifuged to see whether it will throw a deposit which is excessive or otherwise abnormal. The reaction and centrifuge tests can only be carried out satisfactorily in a laboratory and this of course applies also to the examination of the milk for streptococci, which is the most reliable method of all. In whatever way the examination is conducted, however, the milk of individual cows should be tested ; subsequently, all that is necessary is that infected animals should be milked last. For this purpose, owners will find it preferable to have them grouped apart in the cowshed but separation at pasture is not required. It is to be noted that first-calving heifers are almost invariably healthy and that infected cows are usually the older animals ; the latter will be gradually weeded out of the herd.

By adopting such comparatively simple measures, it is possible to build up a herd from which the bulk of udder trouble will have been eliminated.

IV.—Diseases of Sheep Caused by Anaerobic Bacteria.

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Within recent years investigations carried out in this country and in other parts of the world have shown that a number of acute and fatal diseases of sheep are caused by what are called "anaerobic" bacteria. Before considering the more important of these diseases, it is necessary to refer briefly to the general characteristics of the bacteria in question.

The term "anaerobic" refers to a characteristic shown by many quite different bacteria, namely, an inability to grow and multiply when surrounded by free, uncombined oxygen in a

proportion similar to that in which oxygen is present in the air. This is so whether the bacteria are in a liquid nutrient fluid containing all the constituents needed for growth or whether they are on the surface of a nutrient jelly fully exposed to atmospheric air; but in both cases growth will proceed when the free oxygen is reduced below a certain amount.

A second characteristic of the anaerobic bacteria is that of forming "spores", bodies which are analogous in some respects to the seeds of plants. Each bacterium is capable of forming one spore. Spores are relatively resistant, *e.g.* to the destructive influence of heat, disinfectants, drying, etc., and they are capable of surviving for long periods under conditions which are unfavourable to active life. Should conditions become suitable for growth, the spores germinate and reproduce the original form of the bacterium which then begins to multiply actively. A further characteristic of many of the anaerobic bacteria which produce disease is that of forming poisons or so-called "toxins". When these toxins are formed within the body of a susceptible animal, or when they are introduced artificially, disease is set up, and inasmuch as the toxins of the various species differ from one another they set up different diseases.

The anaerobic bacteria causing disease in sheep are present in the soil, but it does not follow that when eaten with herbage they always produce disease. Under certain conditions, however, they may do so, and as their action upon the body depends upon their power of elaborating toxins, the protection or immunisation of sheep is concerned with neutralising the effects of these toxins. Now it is fortunate that a satisfactory immunity can be set up by giving animals toxins which have been modified in various ways, so that they are no longer harmful when injected. In this connexion it should be noted that the bacteria alone, without their toxins, are comparatively innocuous; this is shown by the fact that bacteria from which the toxins have been removed may be inoculated in large doses into the bodies of sheep without any disease occurring. If, however, small numbers of the bacteria are inoculated together with a small amount of toxin the bacteria are enabled to grow and produce more toxin, so that the animals readily fall victims to the disease. A similar result may occur without the addition of toxin if the bacteria are inoculated along with dirt, débris and other bacteria, or if the inoculated part is injured in some other way.

The diseases we are considering generally tend to remain more or less localised in special parts of the country. In some cases this can be attributed to a greater prevalence of the particular microbe in the soil of these areas, but in other cases

the reason for a special distribution of the disease is not yet clear.

Braxy or Bradsot.

Braxy has been recognised for many years in certain areas in Scotland and more recently it has been identified in the North of England, in Wales and Ireland. The same disease in Iceland is known by the name of Bradsot and at one time in that country the disease was responsible for a mortality amounting at times to 20 per cent. or even more.

The majority of deaths occur during the late autumn or early winter months and it is agreed that sheep are usually found dead in the morning following a night's frost. Young animals, lambs of the previous year, are generally more susceptible than older sheep, and affected animals are almost invariably in good condition. Sheep which have lived through a braxy season may be more resistant to infection than animals of a similar age which have never been on braxy land.

As a rule, symptoms of illness are not noticed, but, when seen alive, the affected sheep is dull and apathetic, not feeding or ruminating, and lagging behind the flock. The animal tends to remain lying, but from time to time will show restless or spasmodic movements and just before death there may be irregular running or kicking movements. These symptoms, however, cannot be taken as diagnostic, because similar symptoms are shown by sheep affected by other diseases caused by anaerobic bacteria.

On *post-mortem* examination characteristic changes are found in the fourth stomach or abomasum. These consist of areas of acute congestion or inflammation, which may be seen as purplish patches on the stomach wall even before the organ is opened and examined from the inside. These areas of inflammation are caused by bacteria invading the wall of the stomach, and in microscopical preparations masses of them can can be seen in the inflamed parts. The organism causing braxy is often spoken of by its French name of "*Vibrion septique*" and it produces a powerful toxin. The inflamed areas in the fourth stomach are the parts primarily attacked, but from these the bacteria may be carried widespread to other organs in the body. Death is due to a toxaemia or blood-poisoning, the toxin being produced primarily in the affected parts of the stomach wall but ultimately by the bacteria multiplying in other organs.

The causal germ is very widely distributed in nature and is often found in the bodies of sheep which have died from some other cause than braxy, should the bacteriological examination be delayed until an hour or two after death. Consequently,

the recovery of the bacillus from the body of a dead sheep is not necessarily proof that the animal died from braxy. In braxy, however, very useful information can be obtained by making a *post-mortem* examination. When inflamed areas are found in the stomach of a sheep which has died suddenly on ground where braxy is known to occur, and at a time of year, autumn or winter, when the disease is likely to be prevalent, there is very good evidence for the existence of the disease.

In the British Isles the most conclusive researches on the cause of braxy were carried out in 1922 by Gaiger (Ref. 16). The lesions found by him in the fourth stomach were closely similar to those described by Jensen in Iceland in 1915 (Ref. 17) in sheep affected with bradsot, and there is now no doubt as to the identity of braxy and bradsot.

Vaccination against bradsot has been practised in Iceland since 1897, the bacteria used in the preparation of the vaccine apparently being *Vibrion septique.* Since 1923 reports are available on the vaccination of sheep in Scotland. The types of vaccine used in both countries have varied, but in recent years the vaccine has consisted of a culture of the organism grown in a liquid or broth medium, to which a small percentage of formalin has been added after the period of most active bacterial growth, by which time there is present a high concentration of toxin. The addition of the formalin renders the toxin innocuous, without impairing its value for stimulating the production of neutralising substances called antitoxins when the vaccine is inoculated into animals. The active bacteria in the culture are killed by the formalin. Some of the spores which have been formed may indeed survive ; nevertheless, the inoculation of this type of vaccine, consisting of formalinised culture, can be carried out with apparent safety. Thus in 1932-33 the Animals Diseases Research Association of Scotland issued from the Moredun Institute nearly 35,000 doses of the vaccine without receiving any complaints, while in Iceland the use of this type of vaccine has steadily increased from 4,000 doses in 1929 to 80,000 in 1930 and to 110,000 in 1931. That the immunity so produced is satisfactory may be seen from the figures given by Gordon (Ref. 18) regarding vaccination in Scotland, where returns of 19,328 vaccinated sheep showed that only 0·75 per cent. died from braxy ; on farms where control animals were kept, out of 3,588 vaccinated sheep only 0·8 per cent. died from braxy, whereas out of 1,886 unvaccinated sheep 8·4 per cent. died from the disease. Dungal (Ref. 19) has reported similar beneficial results from the use of the formalinised vaccine in Iceland, and, in commenting on the safety with which the vaccine may be used, he states that in 1931 particulars were received regarding 32,263 vaccinated

sheep and in not one case had the inoculation caused the loss of a sheep. The control of braxy by vaccination may, therefore, be accepted as satisfactory, and farmers who lose sheep from this disease should consider taking advantage of the available methods.

There still exists no scientific explanation of the reason why a widespread bacterium like *Vibrion septique* can invade the walls of the stomach and cause braxy in some sheep in certain districts, while in other districts the disease is unknown. This is an interesting problem which is quite unsolved.

Gas Gangrene.

This is the name applied to a condition in which parts of the skin or mucous membranes, with the underlying tissues, become gangrenous and may contain bubbles of gas. A similar condition was commonly seen among wounded soldiers during the Great War. In sheep also the disease is almost always a complication of wounding, *e.g.* from shearing, castration or docking, the bacteria entering through wounds. A number of animals may be affected at the same time. It is also liable to follow upon lambing, particularly where the case has been a difficult one. In this country the disease has been studied among sheep on Romney Marsh by Roberts and McEwen (Ref. 20), who found that the bacterium mainly responsible is closely similar to that which causes black-quarter in cattle. Twenty-four hours or so after the injury has been inflicted the animal ceases to feed and ruminate. When a limb or limbs are affected movement is painful and later becomes impossible. Within a short time the animal remains lying down, breathing becomes hurried and laboured and the animal is in obvious pain and distress. An examination will then reveal swelling of the affected parts and a reddish discolouration of the skin. Death follows within 12 to 24 hours from the time that symptoms are first noted, but before this occurs the disease may have extended to other parts of the body. The disease is readily recognised, on *post-mortem* examination, by the local discolouration of the skin, and by the infiltration of the underlying muscles with reddish fluid. In cases where infection has occurred by the genital passages these are swollen and dark red in colour.

Since vaccination against black-quarter in cattle is successful, there appears to be no reason why vaccination against gas gangrene in sheep should not be efficacious, but as the disease occurs in an irregular manner, being present some years and absent in others, vaccination has not been carried out widely enough to warrant definite conclusions as to its value. Preventive measures consist of adopting methods of cleanliness n the performance of all operations and selecting clean pasture

on which to perform operations such as castration and docking. McEwen and Roberts (Ref. 21) have recently shown the value of a serum prepared against the black-quarter organism for the treatment of ewes which have had a difficult lambing. If the treatment is to be successful it is important that the serum should be injected immediately after lambing.

Struck.

The name "Struck" is frequently used to denote cases of sudden death in sheep and cattle where the cause is not apparent. The condition, as it occurs among sheep on Romney Marsh has been investigated by McEwen and Roberts (Ref. 22). In this district the losses from "Struck" are most frequent during early spring, especially when grazing is scanty or when the pastures are very heavily stocked. Sheep in good condition are said to be the most susceptible. McEwen and Roberts were able to establish that in many of the so-called cases of "Struck" the animals were affected with a particular disease with characteristic lesions, *viz.*, large accumulations of fluid around the organs in the abdominal cavity, peritonitis, congestion and sometimes ulceration of the lining of the small intestine. The disease is caused by an anaerobic bacterium which is a member of a large group known as the *Bacterium welchii* group. The bacterium could not, indeed, be obtained from the body tissues in all cases but, where this was so, death could be attributed to multiplication of the organism within the intestinal contents, with the formation of a toxin which was absorbed into the blood.

With regard to prevention, the possibility of protecting ewes by injecting toxin, previously rendered innocuous by means of formalin, has been demonstrated. It is doubtful, however, whether farmers would make a practice of regularly vaccinating their sheep against the disease, because its incidence varies so much from season to season. In some years the mortality is relatively high, but in other years the disease is almost unknown.

It is interesting to note that the bacterium which causes "Struck" is closely similar to that which causes lamb dysentery. Some bacteriologists have indeed regarded them as identical but evidence from the field does not support this view. Thus, in the Kent breed of sheep on Romney Marsh, lamb dysentery is unknown and the lambs remain healthy although the ewes during the lambing season may be dying of "Struck". As lamb dysentery is a serious disease causing a high mortality it is unlikely that its existence in this region has been overlooked.

Lamb Dysentery.

A full account of the symptoms and earlier research on this disease will be found in *Agricultural Research in* 1927 (Ref. 23). The disease is widespread in areas of Scotland and Northern England, and of recent years has been recognised in a number of different counties in the Midlands and the South of England. Lambs generally contract the disease during the first few days of life, and those suffering from the acute form may be found dead in the morning without symptoms of illness having been observed. Generally, however, the lambs are noticed to be ill for several hours, and occasionally the disease may appear in a more chronic form, the animals surviving for several days. Affected lambs may suffer from a diarrhoea which is frequently blood-stained. The mortality may reach 30 per cent. At *post-mortem* the intestine is found to be congested, numerous ulcers are often present in the small intestine and its contents are frequently blood-tinged.

Recent researches have made it clear that the bacterium which causes lamb dysentery belongs to the *Bacterium welchii* group and, as stated above, it closely resembles that which causes "Struck". The symptoms are really due to the toxin produced by the lamb dysentery bacterium. Thus, in acute cases of the disease, as is also sometimes the case with "Struck", the organism is confined to the intestinal contents, and here it produces a powerful toxin which after it has been absorbed into the blood is responsible for the symptoms. It is only in cases where there is ulceration of the intestine that the organism is found to have invaded the tissues, and it is then present in enormous numbers in the ulcerated areas of the bowel.

Dalling, Mason and Gordon (Ref. 24) showed that to prevent lamb dysentery it is sufficient to protect the lambs against the toxin of the organisms, and that there are two ways in which this may be brought about. The one is to vaccinate the ewe before lambing and the other is to inoculate the lamb with antitoxic serum as soon after birth as possible. On farms where the disease is known to occur the former method is more satisfactory, but where the disease appears unexpectedly it may be controlled by the latter method. When the ewes are inoculated before lambing the most recent method is to give two inoculations of a vaccine prepared with the causal bacterium and its toxin. Previously a mixture of toxin and antitoxin was used. The lambs are born without any protection or immunity, but within a very short time after sucking, their blood contains substances capable of neutralising the toxin of the organism. These substances are obtained from the colostrum of the immunised ewes, and they are rapidly absorbed from the lamb's intestine into the blood stream. Whichever method of pro-

tection is practised the resulting immunity is a temporary one, but lasts long enough to tide the lambs over the susceptible period, namely, the first two or possibly three weeks of life. The value of protective inoculation is illustrated by the figures given by Dalling, Mason and Gordon (Ref. 24) concerning the results of vaccination on farms where control (unvaccinated) sheep were kept. On one group of 14 farms where a proportion of the ewes were treated with toxin-antitoxin mixtures, 935 lambs were born to the treated ewes and only 1 per cent. of these died from lamb dysentery, whereas on the same farms, out of 1,123 lambs born to unvaccinated ewes 10 per cent. died from the disease. When another type of vaccine was used, *viz.*, a culture of the bacterium treated with formalin, it was found on 14 farms that out of 1,224 lambs born to vaccinated ewes 1·06 per cent. died from lamb dysentery, whereas, of 1,333 lambs whose mothers had not been vaccinated 14·33 per cent. died from the disease. The figures relating to lambs inoculated with antitoxic serum within 12 hours of birth are equally satisfactory ; thus the mortality from lamb dysentery, among lambs treated with serum, was 0·37 per cent., while on the same farms among 648 lambs kept as controls the death rate was 20·9 per cent.

Protection conferred by the vaccination of the ewes or by the inoculation of the lambs with antitoxic serum is widely practised to-day. Figures showing the total numbers of animals treated yearly are not available, but these must number very many thousands.

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FARM IMPLEMENTS AND MACHINERY.

I.—Power Farming.

The development of power farming in this country has now been going on for about four years, and many of the revolutionary methods introduced may be said to have passed through their experimental stage and to have become integral parts of our farming system. The pioneers of the movement, whether engaged in growing cereals or in dairying, had one common object: that of making farming pay. They adopted new machines because to save labour was the most obvious way of reducing production costs. If, in general, they specialised on a single product, it was not because their machinery demanded it, but because, having perfected one process, they would be better able to judge what to add to it. In a paper describing a survey of some of these farms, Newman (Ref. 1) points out that however they may vary in type they have one feature in common, that they make the utmost use of organised machinery to increase the output per man employed. It is impossible to lay too much emphasis on the fact that their machinery is "organised", and it is in this connexion that the survey of mechanised farms, which the Institute for Research in Agricultural Engineering is carrying out, is of the utmost importance. Whether from advertisements and catalogues or from visits to agricultural shows, it is easy enough for a farmer to secure substantially accurate information about the capabilities of particular machines. But information about the hundred and one details of management which make those machines part of an organised scheme, and about the home-made "gadgets" which contribute to its success, is not so easy to secure. One important function of the survey is to enable such information to be collected and passed on either in published notes or in response to direct enquiry. Another function is to secure, in course of time, reliable data about the wearing powers and maintenance costs of machines. Yet another is to study the

effect on overall working costs of such factors as the "heaviness" of the soil and the size of the field. Newman also points out that the survey affords an opportunity of studying the social effects of the adoption of machinery and remarks that over the whole area under review, amounting to some 35,000 acres, the tendency so far has probably been to increase employment.

One of the chief causes contributing to the spread of power farming has been the plight of many landlords who have had to take in hand arable farms whose former tenants have given up the struggle to make ends meet. How the situation was met in the case of a College farm is described by Watson (Ref. 2). All the arable land, and the poorer pastures of two adjoining farms, amounting in all to 480 acres, was taken in hand and equipped on modern lines for cereal growing. On the heavier land a three-course rotation of two wheat crops followed by a fallow is worked, while on the lighter portions a rotation of three corn crops (wheat-barley-barley) and a fallow is to be attempted. The choice of these rotations brings out one feature of the progress of the last few years. The earliest British specialists worked a two-course rotation with a fallow every alternate year. Fallows as produced in a normal season by tractors and up-to-date implements, however, proved to be so much better than they ever were when horses were used that it soon became apparent that longer intervals could be allowed between them. There are two other points of special interest about this farm. The first is that although only three regular hands are employed there is apparently not always enough work for them to do, and it is remarked that 50 acres of hay would provide useful full-time work in June. The second point is that, however successful the results are, specialist cereal growing is not to be the final end of the venture. A herd of 300 pigs is to provide an outlet for straw and tail corn and it is proposed to make use of the dung to grow canning crops on some of the more suitable land. The concluding words of this paper are likely to be comforting to those who see in mechanisation a menace to our social system : "The ultimate hope is that something like the old number of men may again be employed, and that meanwhile the output will have been raised to such a level as to provide an adequate wage for every member of the staff and at the same time provide a fair return to the College. Needless to say, it will take some years to attain this end : meanwhile, however, the financial results are encouraging". In this instance therefore it is not intended in the long run that mechanisation shall drive labour off the land. Nevertheless the final farming system at Long Wittenham will differ considerably from the old, and the bulk of the land will have to do

without treading and animal manure. Many competent authorities are still doubtful whether in these circumstances fertility can be maintained indefinitely, at any rate on the lighter lands—where incidentally power farming is making most progress. It is interesting therefore to turn to a farm which has been mechanised without change in system.

Messrs. Crouch's farm in Wiltshire (Ref. 3) is a mixed farm in the truest sense of the word. A large portion of the 750 acres of arable is worked on a conventional four-course rotation including a root break folded with sheep. The remaining arable is devoted mainly to saleable crops : corn, sugar beet and potatoes. There are also 150 acres of permanent pasture and 300 acres of down land, and apart from the main arable block the various departments of the farm include dairying, sheep, pigs, poultry and market gardening. Several reasons are given why Messrs. Crouch were unwilling to change their system of cropping appreciably, however imperative it was to mechanise their holding. Among them may be noted that continuous corn growing was regarded as an impossibility on the lighter land ; that it was undesirable to cause local unemployment ; and finally that it was particularly undesirable to have all their eggs in one basket. However, the restriction to an existing system does not seem to have caused much difficulty. Four years ago, when the arable acreage was less by 150 acres, fourteen horses were kept. To-day there are four horses and two tractors. The displacement of horses was gradual, the final stage being reached in 1932 when the cultivating implements were grouped in large tractor units and the binders, already tractor drawn, were replaced by a combine harvester. To-day two men do practically all the cultivations and so far they have not been called upon to work at night. It is to be hoped that more detailed particulars of the working of this farm will be made available in due course.

A fitting conclusion to this section of this article is provided by reference to a further paper by Newman (Ref. 4). After reviewing recent progress, he points out that existing farms have already exploded the idea, firmly held by the British Agricultural community, that the methods of corn growing used abroad are, for climatic reasons, impossible in England. He sums up his paper in the words : "What scientific and mechanical developments have done for wheat growing, it is technically possible for them to do for other branches of agriculture . . . . Climatic handicaps can be minimised or side-stepped and climatic advantages made the most of. It is possible greatly to increase the output of food from English land without raising its price to a figure which will restrict consumption or

inflict hardship, while allowing of more adequate remuneration for the producers than has been the case in the past".

Although in the foregoing papers it has more than once been suggested that power farming in Great Britain has not tended to produce unemployment, it is obvious that, in the long run, mechanisation will displace labour from agriculture as it has done from other industries. A recent American Government survey (Ref. 5) shows how the process has been going on in that country. In 1830, 57·7 man-hours were required to produce 20 bushels of wheat from one acre of land. By 1896, mainly owing to the introduction of harvesting and threshing machinery, the labour requirement per acre had fallen to 8·8 man-hours. In 1930, as a result of modern methods, the corresponding figure had been further reduced to 3·3 man-hours. On the other hand, the horse-power available per man employed has gone up in the last 80 years from 1·5 to 6·7. Fletcher (Ref. 6) commenting on the results of this survey, points out that labour saved on the farm means more labour employed in other industries. Although a 1,000-acre cereal farm may only need 1,400 man-hours of labour, the $5,000 or so invested in equipment will represent from 2,500 to 3,000 man-hours of work outside. The greater part of the million farm workers who have been displaced from American farms during the last 20 years were unpaid family workers. For these, mechanisation has meant a better start in life and a better education.

II.—Tractors and Farm Engines.

The word "mechanisation", which is so freely applied to modern farming developments, might have been used almost as accurately to describe the changes of the last two generations: the replacement of the flail by the thresher; of the scythe by the mower; and of the sickle by the reaper and the binder. The one feature, however, which gives the present movement the greater right to the title is the replacement of the horse by the tractor, and practically every extension of the movement depends ultimately on making the tractor more and more an all-purpose machine. A steady widening of the range of available tractors is noted as the main feature of tractor developments in 1933 (Ref. 7). So far as this country is concerned, the introduction of two tractors smaller than any in current use is of particular importance. The introduction at the other end of the scale of high-powered Diesel-engined tracklaying tractors is only less important because, while they are definitely more costly to buy than some other types, it is not yet certain that they will be less expensive to run and

maintain. In the same paper the possibilities and some of the limitations of pneumatic-tyred tractor wheels are discussed. One of their real advantages is that they can be used on roads and so can play a more effective part in farm haulage. Their theoretical advantage over steel wheels, in being subject to a much lower rolling resistance, cannot always be turned to practical account—presumably because the question of correct gear ratios has not yet been studied. It is also stated that while on cultivated ground they will exert a greater drawbar pull than steel wheels, their ultimate limit of about 2,000 lb. on firm ground places them at a disadvantage unless higher speeds are used. It is worth remarking that under the abnormally dry conditions of the past year the last two statements need to be modified. With field surfaces growing ever more like concrete roads the estimated limit of 2,000 lb. pull may be considerably exceeded by pneumatics, while on very dry cultivated land the differences between the two types tend to disappear.

In America pneumatic-tyred tractors are obviously exciting enormous interest. One recent issue of a leading agricultural engineering periodical is devoted entirely to the subject and contains no less than fourteen papers giving the results of tests in different States. The most complete tests were those carried out by the University of Nebraska (Ref. 8). They included careful comparisons between pneumatic-tyred and steel wheels in performing fifteen different farming operations. Similar but less extensive tests were carried out in Kansas, California, Illinois, Iowa, Indiana, Idaho, Saskatchewan, Texas and New York (Refs. 9–17). In some cases the field tests were supplemented with straightforward drawbar tests. The results of all these trials may be said to be favourable to pneumatics. In general, whatever general farming operation was carried out, the fuel consumed per acre was lower than with steel wheels, while, except where the greater effective diameter of the steel wheels was the controlling factor, the pneumatics covered a greater acreage in a given time. The savings in fuel actually recorded vary from 10 per cent. to as much as 40 per cent. It seems probable, however, that where the higher figures were obtained the steel wheels were not being used to their best advantage and that, with existing tractors in general practice, the reduction in fuel consumption consequent upon a change to pneumatic tyres would not exceed 10 to 15 per cent. In further tests carried out in Minnesota and Pennsylvania (Refs. 18 and 19) "zero pressure" or cushion tyres were included. Their performance was similar to that of pneumatics and they had the advantage of avoiding inflation difficulties.

The technical results of all these tests, and indeed of all similar comparative tests, can be summed up in one of the conclusions from the Nebraska paper: "Within the limits of its tractive effort a pneumatic tyre is more efficient in transmitting power than a steel wheel and spade lugs". Or as another writer puts it (Ref. 20), "As a traction member the rubber tyre has, with few exceptions, appeared to be more efficient but less effective than the lugged steel wheel". Whether the tractive effort, *i.e.* the drawbar pull, is sufficient will obviously depend on the state of the ground. Since, in most of the papers already discussed, the fact that pneumatic tyres raise less dust is commented upon, it is to be concluded that, in general, conditions were dry. Where wetter conditions have to be met, as was the case in Louisiana and Wisconsin (Refs. 21 and 22), the success of pneumatics is much less assured.

On the whole it may be concluded that on the smaller tractors of 10 to 15 drawbar horse-power, the use of pneumatic tyres will become more general, at any rate in districts of low rainfall, but that even here additional adhesion devices will be needed on occasions, unless valuable working days are to be lost. Where larger tractors are concerned, the position is not so clear. It is too often stated as an advantage of pneumatics that they can be worked in a higher gear on a given job. It is too seldom admitted that generally they are worked in the higher gear, not because it is advantageous from the point of view of the work, but because it is the only way in which the full power of the tractor can be used. Practically all the tests show that with larger sizes of tractors a higher working speed is essential if the fuel economies of pneumatics are to be realised, and it is a matter for some doubt whether, in practice, the money saved on fuel would pay for the increased wear and tear, particularly on the implement. It is also uncertain whether a higher speed will always benefit the actual work being done. In one case it is reported that when ploughing was done in top gear the furrow slice turned completely over and landed top side up! On the other hand, one British farmer reports that top-gear work improved the evenness of sowing of small quantities of artificials, while another refers to the advantages of the pulverisation produced by high-speed ploughing on stubbles. It is convenient to refer at this point to the introduction of pneumatic tyres for farm carts and implements, since their development is closely connected with that of the tractor equipment. In haulage work an increased tractor speed will have obvious advantages but will demand vehicles that are smoother running and of lighter draught. Wilson (Ref. 23) points out that pneumatic-tyred cart wheels will fulfil these objects and quotes the results of a recent official test (Ref. 24)

to show that they reduce draught and permit considerable increases in payload. The application of these tyres to such implements as mowers, binders, and combine harvesters is also referred to. It may also be remarked that an essential feature of the high-speed manure-sowing referred to above was that the distributor was fitted with pneumatic tyres.

The results of some German trials (Ref. 25) are also of interest since, in addition to wagons fitted with wooden, steel and pneumatic-tyred wheels respectively, the draught of track-laying vehicles was measured. Pneumatic-tyred wheels always had an advantage over the other types of wheels, but the reduction in draught consequent on their use was less marked under bad than under good conditions. On light stubble, pneumatic tyres reduced the draught of an ordinary wagon by about 60 per cent.: on wet, heavy land the corresponding reduction was less than 10 per cent. Under the latter conditions the tracklaying vehicles had very marked advantages, and in such work as hauling off sugar beet late in the season, they may eventually prove to be the only solution. The comparative failure of pneumatics on heavy, wet fields appears to be due to the fact that in these circumstances some sinkage is inevitable whatever wheels are used, and whereas the ordinary cart wheel cuts through mud, the wider, smaller-diameter, pneumatic-tyred wheel is inclined to pile up the soil ahead of itself. The same criticism was noted in a paper already referred to (Ref. 21) where the behaviour of pneumatic-tyred carts on Louisiana sugar plantations is discussed. In addition to the handicap of a heavy "gumbo" soil, this district suffers from an average rainfall of 15·6 inches during the harvest period. The wheels became so clogged with mud that complete stoppage resulted, and it was only by fitting tyres of tractor size that the trouble could be cured. This of course would be a very expensive solution of the problem.

Although paraffin is the fuel most widely used for tractor operation in this country, a few farmers continue to use petrol on the ground that what they lose in increased fuel costs they regain in lower depreciation. A paper by Krieger (Ref. 26) points out that most tractor engines are designed, with consequent loss of efficiency, to run on either fuel. If they were designed to run exclusively on petrol their overall efficiency might be increased by something like 25 per cent. Not only would their fuel consumption be lowered, but a much lighter engine for a given output would result. Even with existing engines, however, great improvements might be effected in their operation on petrol by suitably modifying the accessories —carburettor, ignition, etc. A paper by Stapleton (Ref. 27), devoted mainly to a study of compression ratios, reaches a

similar conclusion, *viz.* that, in spite of the difference in price between petrol and paraffin, petrol, properly used, might be the cheaper fuel in practice.

The importance of fully loading a tractor in order to secure economical working is dealt with by Schwantes (Ref. 28). The data collected during a survey of 300 tractors in Minnesota (which was referred to in the *Farmer's Guide* for 1931) are here interpreted to show how the cost per unit of work rises as the loading of the tractor is lowered. It is remarked that it is not unusual in practice to find tractors working at only half load: in fact, unless small tractors only are used, such under-loading is almost inevitable in work like haymaking and drilling. It is not, however, generally realised that under such conditions the cost per unit of work done may rise by something like 66 per cent. above the normal figure.

Reliable figures about the costs of working tractors in Great Britain have been very difficult to secure hitherto. As a result of the Survey of Mechanised Farms, already referred to, such figures are beginning to become available. In one note (Ref. 29) full particulars are given of the expenditure during two years working of a four-wheel drive machine. Over the whole period 2,754 hours were worked on 330 days at a cost excluding depreciation and interest of just under 2*s.* per hour. On another farm of 550 acres devoted entirely to wheat growing (Ref. 30) the total cost of fuel and lubricating oil averaged 12*s.* 11*d.* per cropped acre over two years. In a third note (Ref. 31) the costs of individual operations are given in such a way as to illustrate the economies which result from large fields.

Although the outdoor aspects of farm power receive nearly all the publicity, it is probable that, in this country, the total horse-power involved is only a fraction of the aggregate horse-power developed by barnyard engines. Recent progress in the design of such engines is described by Black (Ref. 32) who points out that the main feature is the introduction of ever smaller crude-oil engines. The principle on which these engines work is briefly discussed, together with the special starting arrangements adopted in the larger sizes. The most novel of these has so far been applied only to tractor engines. In effect the engine is so constructed that it can function either as an ordinary petrol engine or on the compression-ignition principle. The engine is started on petrol and, after it has warmed up, automatically changes over to compression ignition. The paper also discusses the application of small engines to provide a direct drive for mowers and binders.

III.—Haymaking and Harvesting Machinery.

After several years of very rapid progress there appears to have been during 1933 a pause in the development of mechanised haymaking. No doubt this means that recent advances have been sound and that the position is being consolidated. A summary of modern methods has been given by Cashmore (Ref. 33) whose paper also includes an account of further work with the combine-baler. In spite of the relatively small bales produced by the only machine yet imported, the rate of working was definitely speeded up during the past season. An average rate of 1½ tons of dry hay per hour was maintained in baling a 26-acre field of hop trefoil and ryegrass, the daily output being about 15 tons. Since two men on the baler cannot at present keep up with continuous running at 2 m.p.h., it does not appear that the rate of working can be increased unless a machine capable of making a larger bale is used. Cashmore also refers to some observations, made for purposes of comparison, of baling done in the field with a haysweep and a standard stationary baler. On the whole the stationary method showed promise of becoming the better process, particularly when the baler has been modified so as to take its material from ground level instead of from a rick.

With a view to increasing the number of working days of the combine-baler, and so reducing the daily overhead charge, the machine was tried on straw behind the combine harvester and also on green grass for silage. The experiment on straw was as successful as the limited size of bale allowed, but the silage experiment failed completely. When examined after five months the bales had almost entirely decomposed.

It is interesting to compare the above account of the Combine-Baler with an account of its working in Minnesota (Ref. 34). Here, although the size of bale was no greater than was produced in the English trial, a rate of 2⅝ tons per hour was reached with lucerne. Since the limiting factor in this country has been the capacity of the men to tie and handle the bales, it seems probable that further practice is necessary.

In one branch of farming allied to haymaking—the production of grass and lucerne meals—considerable progress has been made during the past year. An account of a plant dealing with lucerne on a commercial scale in Norfolk (Ref. 35) states that the material is hardly touched by hand from the time of cutting in the field till the delivery of the meal into bags. Cutting is done with an ingenious modification of a binder in which the binding and knotting mechanism is replaced by an elevator which delivers the lucerne straight into a pneumatic-tyred trailer, separately hauled alongside. The contents of the

trailer are eventually tipped close to a slow-moving conveyor, and it is in forking the lucerne on to this that the only hand labour is used. The passage of the material through the conveyor-type drier and thence on to a chopping device and a hammer mill is entirely mechanical, and the interval between cutting and the final delivery into bags as dry meal is only about two hours.

It is pointed out by Newman in a paper already referred to (Ref. 1) that one result of the introduction of the combine harvester has been to set people thinking of possible alternatives. The ruling principle of most of these is to thresh in the field with a stationary drum and to utilise a drier to make the method more or less independent of the weather. What is required in fact is a method of avoiding expensive hand labour between the reaper and the thresher. The lucerne cutter mentioned above is one obvious possibility which, however, has not yet been tried. Another proposal, also untried, is to use a binder with its knotter platform raised high enough to eject the sheaves into a cart. Among methods which have been tried is the use of hay sweeps in conjunction with a self-feeding thresher, reference to which is made by Cashmore (Ref. 33).

Even when threshing is to be done in the farmstead, either from the stack or from the wagon, there is scope for saving labour as compared with the ordinary methods of carrying the crop. One new device with this object in view is the "Harvester-pitcher", described in an article (Ref. 36) which includes pictures of the machine at work. It is a combination of the hay sweep and the hay stacker, and is fixed to a tractor which draws a wagon behind it. The sweep, which has steel tines, is specially designed to pick up one stook without disturbing it. It then pivots about the back axle of the tractor and delivers the stook over the driver's head on to the wagon.

It must not be inferred from this discussion of alternative methods that the Combine Harvester has lost favour. Newman's article mentions that 48 of these machines were at work during the 1933 harvest and, in exceptionally favourable circumstances, achieved remarkable performances. One machine cut 485 acres during the season, certainly a record for this country, and needed no repairs although it was doing its fourth year's work.

In the last number of the *Farmer's Guide* mention was made of the difficulties that had been experienced in using combine harvesters in the corn belt of the U.S.A. In the meantime the "Corn-Belt Combine" has appeared (Ref. 37). Although the crops to be dealt with in this region are more varied than our own, the difficulties which confront the

standard combine are, on the whole, very similar to those which would limit its use in our mixed-farming districts. The new machine, therefore, should be specially interesting to British farmers. Its most interesting features are that it takes only a five foot cut and so can be hauled and driven by a relatively small tractor, and that it costs little more than a power binder. The drum is immediately behind and parallel to the cutter bar, while the cleaning arrangements are placed cross-wise so as to give a long travel for the straw without adding length to the machine. Finally it is mounted on pneumatic tyres so that its draught, even on moist ground, is appreciably reduced.

There is a definite indication that combine users will not always be content to leave their straw on the ground, and some of the lessons already learnt in haymaking are being applied. A new machine for dealing with straw from the combine is the pick-up press (Ref. 38), which collects straw from the windrow and turns it out in trusses similar to those made by the trussers ordinarily used with stationary threshers.

IV.—Cultivating Machinery.

The introduction of steam ploughing in the middle of last century caused a good deal of land which was originally laid up in "ridge and furrow" to be ploughed flat. On some of this land to-day there is a noticeable tendency to return to the old system of stetch ploughing, since on some soils its advantages in disposing of surface water outweigh the complications which it may introduce at harvest time. Very similar arguments are used to support the Pelo Pardi system of cultivation which is receiving a good deal of attention in Italy (Ref. 39). In this system, which depends for its success on the use of a special plough, the land is laid up in ridges very like our own. The novel feature of the Italian method, however, is that, in theory at any rate, it is the surface of the subsoil which is ridged and which is designed to drain off superfluous moisture after it has percolated through the layers of worked soil. The plough is specially designed to produce and maintain a smooth subsoil profile. For this reason it has a quadrangular share wide enough to allow the outer part of its wing to slide on the bottom of the previously ploughed furrow, and a beam which is free to turn in a longitudinal sleeve so that the transverse inclination of the body can be adjusted. The breast of the plough is also unusual in that its curvature is broken in the middle by a flat portion. The effect of this modification is stated to be that the top portion of the furrow slice is completely inverted independently of the lower portion

which is merely broken up. Surface vegetation is thus buried without being deposited throughout the whole depth of cultivation. The plough is stated to be light enough in draught to be well within the capacity of a pair of animals, and to be so stable in work that the ploughman need not control the handles but can walk alongside to regulate it as required. A special cultivator for use after this plough has also been developed.

A recent article (Ref. 40) describes a novel multi-furrow tractor plough designed to overcome the choking difficulties which are sometimes experienced when ploughing in laid stubble, potato haulms and other bulky vegetation. Its special feature is that the horizontal distance (from back to front) between the breasts and also the height of the frame have been increased by 50 per cent., so as to give more than twice the normal area of clearance. Since the beam carries five breasts, this construction results in a very long plough, but in order to avoid turning difficulties the implement is so arranged as to steer on the back wheel as well as on its front wheels. This feature in turn makes the use of a mechanical self-lift impracticable, and a pneumatic power lift is provided. It is claimed that the latter feature has special advantages of its own, in that the plough can be lifted without moving the tractor, while if required, the load can be eased off during ploughing by admitting a little air to the cylinder without actually lifting the plough out of work.

At present research on the design of plough breasts is attracting much attention in America. A paper by Reed (Ref. 41) summarises the work that is being done, particularly on the factors which affect the draught of ploughs. A relatively small increase of draught with speed, of the same order as that found in this country, is noted by most workers in the field.

The most detailed plough study is that which is being carried out in Alabama (Refs. 42 and 43) and includes a mathematical study of the action of the plough breast. The results are being compared with field studies of plough breasts, but since very little information is given about this side of the work, it is not easy to decide what progress is being made. In another paper Seaholm (Ref. 44) deals with the problems of plough manufacture. Most of this paper is of interest only to the manufacturer, but some portions of it are of interest to the farmer since they explain some of the difficulties which he may experience in practice, particularly in regard to scouring.

The proceedings of the World Grain Conference held at Regina in 1923 (Ref. 45) contain some interesting papers on the cultivating methods used in the Canadian Grain Belt.

Two papers in particular, dealing with what is called "deep-furrow drilling", may be of interest to British farmers. The principle of this method is that the grain is sown in the bottoms of deep furrows which have ridges laid up between them.

In the first drill described (Ref. 46) small lister-pattern ploughs spaced at 14 inch. centres open out furrows from 6 to 7 inches wide, over the bottom of which the seed is broadcast. The ploughs are so designed that all the top soil is pushed into rough ridges on either side of the furrow, while about 1½ to 2 inches of the moist subsoil is allowed to drop back on to the seed. The main advantages appear to be that the seed is deposited on, and covered by, moist soil so that germination is more certain, and that the ridges protect the young plant from the weather. The ridges can be harrowed down if necessary once the plant is well established, but it is said to be better practice to allow levelling to proceed naturally under the influence of the weather so that the plant is gradually earthed up. With this drill a seedbed can be prepared on stubbles without any of the usual preliminary operations. The ground can be ridged once without seeding, and drilling can be done when splitting the ridges, so that the whole surface is cultivated.

The second drill (Ref. 47) is of the disc type. Its action is similar but although the row distance is the same the seed is deposited in a rather narrower furrow. Both papers claim that increased yields have resulted from the method.

V.—Electricity.

The electrical development of rural areas has not yet been carried very far in this country, but it is expected that the completion of the National Grid scheme will lead to further progress. It has been pointed out by Denham (Ref. 48) that one primary difficulty facing the farmer who is interested enough to consider using electricity is that it is practically impossible for him to estimate probable running costs. In many cases the tariff will depend on his total annual consumption of electricity and this he cannot know until he has run his plant for at least a year. In general he cannot even seek the advice of his friends since the cost per unit may vary enormously within a few miles radius of his farm. It is suggested in another paper (Ref. 49) that some improvement may be brought about by the recent action of the Farmers' Union in taking steps to expose cases of excessively high charges which are likely to hinder development. Another bar to progress is the fact that farmers generally are still comparatively ignorant about electricity and electrical equipment. It is pointed out, for

example, in a paper by Cameron Brown (Ref. 50) that while the average farmer has a keen appreciation of the "points" of an internal-combustion engine, he still relies almost entirely on the contractor or the supply company to choose his electrical equipment for him. The paper goes on to discuss the various considerations which should influence the choice of electric motors for driving barnyard machinery. Generally speaking, the conclusion is that some of the cheaper equipment is likely in practice to be as good as any. There is little or no difference in the performance of motors of the same type although their price may vary considerably. The extra cost of the more expensive ones certainly means a longer life, but since the cheapest motor should last from 20 to 30 years, this consideration is not of vital importance. Again it is generally unnecessary to spend extra money on special dust- and damp-proof motors, since observation of motors actually in use on farms suggests that standard alternating current motors are capable of standing up to adverse conditions without serious deterioration. One large motor, driving a line shaft, is usually to be preferred to separate motors for each machine because in farming practice the annual hours of work are not sufficient to offset the higher first cost of unit drives, while fixed motors are generally more satisfactory than portable ones. The advantages of a three-phase over single-phase supply are also pointed out. Three-phase motors are simpler and cheaper mainly because they are self-starting and so avoid the necessity for incorporating special starting arrangements. In general, however, this choice does not rest with the farmer, who has to adopt whichever form of supply is available ; it is interesting therefore to note that in Germany a specially cheap range of small single-phase motors has been introduced to meet the needs of those who are being settled on small holdings (Ref. 51). These motors are not self-starting but need a pull on the belt or on a special lever after switching on. Cameron Brown concludes his paper by discussing the relative economies of crude oil engines and electric motors. When fuel or power consumption alone is the criterion, electrical power has to be available at a very low rate in order to be able to compete with crude oil, but when maintenance and depreciation charges are included, the advantage lies with electricity unless a great many hours of work are done annually. As a source of agricultural power, electricity in this country has so far been confined almost entirely to the homestead and little has yet been done to extend its use in the field. Two of the papers already referred to (Refs. 48 and 49) suggest, in fact, that, in view of the efficiency of modern tractors, those interested in the spread of electricity might leave large-scale field work out of their

calculations altogether. A recent account of electric ploughing in New Zealand (Ref. 52), however, sounds rather more practicable. A motor unit has been developed which can be used either to convert an existing tractor or in the construction of a new one. Its principal novelty is the use of a small subsidiary motor to control the winding and unwinding of the supply cable. The switch of this motor is controlled automatically by the tension in the cable, while both the drum on which the cable is wound, and the jib over which it is led off, are mounted on a turn-table which swings so as always to face the supply point. It is stated that the cable control is so entirely automatic that the sharpest of turns can be made without fear of kinking or twisting, and that (unlike previous machines of the kind) this one does not require the work to be specially laid out. Such a machine might well prove, in districts where rates are favourable, to be economical by comparison with an internal-combustion engined tractor. It would appear, however, that its application would be confined to the preparation of seed beds, and that the complication of the supply cable would prevent its being used in the presence of a growing crop. A further paper by Cameron Brown (Ref. 53) suggests that the problems of applying electricity to horticulture are more simple than those relating to general agriculture. Two special applications are for water supply and for sterilising and heating soil. The latter application already accounts for a substantial power-station load in America, and some four million kilowatt-hours are used for the purpose annually (Ref. 54). Experiments have led to the standardisation of equipment and a complete technique is being worked out.

A further report from Maryland (Ref. 55) continues the study of alternative lay-outs which was referred to last year. Cables laid on the surface of the hotbed proved to be much more efficient than those buried in the soil. As much as 40 per cent. less power was required, while germination and rate of growth were improved. Plants grew in actual contact with the cable without injury, and the sole disadvantage of surface heating is that the cable must be laid afresh for each crop, however little intermediate cultivation is done. The report also deals with further studies of the insulation of heated frames. The general principle underlying this work is that, if it is worth while using electricity at all, it is worth while doing everything possible to conserve the heat which it supplies. Although the point is by no means clear, it appears that bottom insulation is more important than side banking. Double glazing, however, does save more power even than complete cinder insulation, and compares favourably with straw or mat

coverings. Glass substitutes were generally unsatisfactory for the lights of electrically heated frames. They were uneconomical in current consumption and moveover suffered from indifferent light-transmission, owing to condensation on the under side. Other points to which attention is drawn are the uneven temperature distribution which may occur on sloping beds, the need for shielding frames from wind and the necessity of avoiding unnecessary cracks and openings. Bewley (Ref. 56) discusses soil heating from another point of view: that of its effect on the crop. His paper describes experiments on soil heating in glasshouses which have been going on at Cheshunt since 1927, the crops concerned being tomatoes and cucumbers. The object of the experiments apparently was not, as in most cases, to find a substitute for hot-beds of animal manure, but to explore the possibility of using altogether higher soil temperatures. The results of seven years' experiments have shown that soil heating up to about 80°F, particularly in the early stages of growth, leads to a definite improvement in the tomato crop. Root development is greater, the roots are cleaner, and the plants remain green and healthy beyond the usual time. The main crop ripens more quickly and a greater weight is picked during the first month. With cucumbers earlier and heavier crops have been obtained. Three forms of heating were tried. The ordinary medium-voltage cable was replaced, on account of its high first cost and comparatively short life, by conductors of ordinary galvanised wire carrying a current at about 10 volts. Finally, in order to reduce running costs, heating was done by buried hot water pipes through which the water was circulated by an electric pump. Of the three systems as used at Cheshunt, hot-water heating was much the most economical—in fact in the case of tomatoes, electrical heating apparently cost more than the extra value of the crop could repay. On the whole it appears that electricity will have to be available at very low rates indeed if it is to be applied to large-scale greenhouse work, mainly because insulation is practically impossible. The deep-rooting habit of the plants themselves makes bottom insulation difficult, while large expanses of glass cannot be covered. One possibility of getting cheap electricity in connexion with glasshouse work is put forward by Senner (Ref. 57). He points out that the boilers installed in the larger greenhouses are capable of being used for fairly high steam pressures. He suggests that steam from them should be used to drive turbine generator sets, the exhaust from which could be passed on to the ordinary heating systems. It is estimated that, making allowance for the fuel which would be used for heating in any case, electricity could be generated at a total net cost of 0·18*d.* per unit. The paper suggests utilising

the electricity for the artificial lighting of growing plants, or even for sale to other consumers. In the light of Bewley's work, it appears that another alternative might be to use electricity for heating the soil as distinct from the greenhouse as a whole.

In order to avoid confusion, it may be worth while to point out the differences between the two applications of soil heating which have been discussed: the heating of greenhouse soil and the maintenance of hot beds. In greenhouses, as already mentioned, heat insulation is impossible. Further, the plants concerned are deep rooting; a considerable depth of soil is required, and deep digging between crops is essential. The cable must therefore either be taken up after every crop or it must be exposed to the risk of damage during cultivation. In either case the probable life of the cable is short and replacement is costly if medium voltages are used. Low voltage bare wires are subject to the same objections, but their actual cost is considerably lower. On the whole, therefore, it is doubtful whether the electrical heating of greenhouse soil is likely to be economical. In frame hotbeds, on the other hand, all-round insulation is easily provided. Moreover, the plants are generally seedlings or cuttings, and no great depth of soil is required. Cables can therefore be protected by a layer of wire-netting or some similar device, and need not be taken up. When eventually something more is required in the way of cultivation than a light scratching of the surface, it is a comparatively simple matter to replace the whole volume of soil. The life of the cable is thus much longer than in the former case and the possibilities of the process are correspondingly greater.

VI.—Drainage.

Although mole drainage has been practised in this country for more than 100 years, very little is known with certainty about the inner working of the process. There is, of course, the obvious difficulty that information about what is happening inside the drain can in general only be secured by destroying it. It is, however, surprising to find that reliable records are lacking about such external aspects as the degree of permanence of mole drains and the way in which their life depends on the nature of the subsoil in which they are drawn. An analysis by Nicholson (Ref. 58) of evidence collected in a survey of about 80 East Anglian farms (Ref. 59) arrives at an average life of about 13 years, and agrees with an estimate made nearly a century ago in the same district. The analysis also showed that when the results were considered statistically there were significant differences between the average lives of drains in

different districts although in some cases the general soil type was the same. The most potent factor in the deterioration of the channels was the physical constitution of the subsoil, and it is pointed out that a few gravelly patches or similar imperfections in the clay may weaken the whole system. The paper goes on to describe some work on a particular drainage system, on Gault Clay, designed to study the question in greater detail. Plaster casts of short lengths of the moles were made at various times up to 7 years after draining. The casts showed that very marked fissures extended from the slit of the drain and that their distribution was such as to suggest that the usual practice of drawing the moles uphill is sound. Deterioration of the drains was due mainly to the falling of lumps from the roof of the channel, and was more rapid where flints and pebbles had caused irregularities at the time of drawing the drains. Although the drains remained open and functioned satisfactorily throughout their length the lumps remained where they fell and were not washed out. After only 30 months of life the section of the channel varied enormously along its length, while after 7 years hardly any trace of the original surface remained.

The paper concludes that while fissuring between the drain and the surface is beneficial to drainage, fissuring in the wall of the channel itself should be avoided. In a second paper (Ref. 60) the same writer studies the workings of these drains in relation to the moisture profile of the soil and the rainfall. Mole draining does not appear to lower the moisture content of the soil appreciably nor does there appear to be any direct connexion between the moisture profile and the outfall from the drains. There was direct correlation between rainfall and overflow in winter but not in summer, when even heavy storms produced hardly any effect. At no time was there any long-continued steady flow from the drains: heavy rain produced a sharp rise in the outflow followed by an almost equally sharp fall. The difference between the rates of flow from shallow and deep drains respectively was insignificant when the outflow was heavy. Shallow drains started to run only a matter of minutes earlier, and while the deeper drains continued to run sometimes for weeks after the shallower ones had ceased, only a trickle came from them at these times. All these features, coupled with some observations which show that, except near the surface, the permeability of the soil in winter is exceedingly small, suggest that, on this particular soil, water gets into the drain only through the slit and its subsidiary fissures. It would, therefore, appear that the mole should be as near the surface as is consistent with the avoidance of damage from the passage of implements and the treading of stock. In the work

just discussed, the flow from the drains was measured at intervals by using a bucket and stop watch. In another piece of drainage research now in progress near Oxford, an automatic recording meter is being used. This device, which is fully described in a recent article (Ref. 61), is said to be capable of recording the outflow from a drain automatically at any rate of discharge from zero up to 4 gallons per minute, which is more than a single drain is likely to discharge. It does not interfere with the free working of the drain and is not affected by silting. Although no results have yet been published it may be remarked that the records so far obtained with this meter fully support Nicholson's conclusions. The flows have been short and sharp, following individual storms, and ceasing entirely between them, and there has been no appreciable time interval between the start of flow of drains of different depths.

A paper by Janert (Ref. 62), describing the new science known as "Kulturtechnik" which is receiving much attention in Germany, is definitely antipathetic to mole drainage. The two main criticisms, neither of which appears to be well-founded, are first that the life of mole drains is too short, and secondly that they cannot be drawn deeply as the slit would only remain open near the surface and so no water would enter the channel. In support of the first contention, an unpublished official British report is quoted as indicating an average life of only about 6 years. It may, however, be pointed out that all the drains referred to were drawn merely to demonstrate the use of drainage machinery rather than to form part of permanent drainage systems and that their early failure was in nearly every case due to neglect of the outfalls. Also, so far as the second objection is concerned, Nicholson's work indicates that, whatever happens near the surface, the slit does not in general close lower down. It appears nevertheless that Continental soils are not so generally suitable as our own for mole drainage, and so a great deal of attention is being directed towards alternative methods. Some of these are discussed in a paper by Blackaby (Ref. 63). Most of the methods described have been dealt with in previous numbers of the *Farmer's Guide*. Among them may be noted the tile ram by which tiles are forced into a previously drawn mole. This is, of course, limited to soils heavy enough to retain temporarily the shape of the channel. Of wider application are those methods in which tiles are drawn in on a cable attached to the mole plough itself. Two distinct applications of this principle are described in some detail: the Poppelsdorf system and a more recent system of Scottish origin. Yet another alternative is provided by a machine which reinforces the channel by a tube of steel ribbon which is formed and inserted automatically as the drains are drawn.

In addition to all these, Blackaby notes two quite new departures. In the first, which is due to Janert, and which has been described more fully by him in an unpublished pamphlet, a continuous concrete pipe is laid. The machine used consists of a mole plough which carries behind the cartridge a "former" of special design which in turn is connected to a hopper. Cement and sand are mixed in the hopper in suitable proportions and the dry mixture is forced to the "former", whence it is extruded as a continuous pipe. A little water is delivered to the "former" at the same time, and wets the inside of the pipe sufficiently to enable it to retain its shape until moisture absorbed from the soil finally "sets" the pipe. It is claimed that the method results in a porous pipe being formed and, since the complete machine costs only about £30, it should have applications in this country.

The second novelty is described rather more fully in a separate article (Ref. 64). The process, which is of Danish origin, consists in making a slit in the soil, the lower portion of which is filled with gravel or other porous material. A hollow coulter replaces the blade of the ordinary mole plough and can be swung about a transverse pivot. By changing the inclination of the coulter, the depth of cut can be varied and so an inclined conduit can be cut in the soil. This conduit is about 1½ inches in width and has an average depth of about 20 inches. It is filled to a depth of about 6 inches with the granular material fed in direct from a hopper, and this layer can be covered with strips of asphalted paper if required. The method is said to be less liable than others to deterioration due to the precipitation of salts from drainage water. It is also less dependent than any other on the particular nature of the soil to be drained.

A further paper by Blackaby (Ref. 65) deals mainly with trenching and ditching machinery. The machines dealt with fall into three main classes, the first of which includes the well-known wedge-type excavators which plough out a narrow trench suitable for medium-depth tile drains. The other machines described are bucket-type excavators, which will dig a much deeper trench, and drag-line excavators whose agricultural application is generally limited to the cleaning out of existing watercourses.

VII.—Miscellaneous Notes.

A second year of drought has caused an increased interest in the problems of water supply. In a recent bulletin (Ref. 66) Cameron Brown discusses in some detail the many types of pumps available for farm and country-house use. Small

electrically driven pumps capable of giving good service are available at quite low prices. Prospective users are, however, warned to make sure that their requirements will not entail continuous running for periods longer than those for which the pumps are designed. Actual working efficiency is of secondary importance since, even in the case of the less efficient ones, the running cost is generally low in comparison with the cost of public water supply in towns. Practically all British rural supplies depend on gravity tanks for storage. In this paper the alternative system of pressure tanks is discussed, and is shown to have certain advantages when automatic control is possible.

Sulphuric acid spraying for the control of annual and biennial weeds in corn has now emerged from the experimental stage and has definitely entered into British farming practice. It is mentioned by MacDowall (Ref. 67) that during 1933 over five thousand acres were treated, on commercial lines, with satisfactory results. A mechanical innovation which may eventually increase the scope of sulphuric acid spraying is the use of rollers or harrows in connexion with the work. These have the effect of pressing or bruising the weeds, rendering them more liable to destruction by the acid. The paper also refers to the possibility already studied on the Continent of adding ammonium sulphate to the spray. This would enable a top-dressing of nitrogen to be applied in the spring at practically no labour cost and would permit the uniform application of smaller dressings than fertiliser distributors allow. In another paper (Ref. 68) the question of mixing acid of proper strength is dealt with and the advantage of mixing actually in the sprayer and checking the strength by a hydrometer is pointed out.

A convincing account of the mechanisation of root crops is still awaited by the mixed-farming community. Doubtless considerable progress is being made in this country but so far this aspect of power farming has not been written up. Even from abroad there is little to report except in connexion with potatoes. The use of mechanical methods in the cultivation of this crop is the subject of a paper by Blasingame and Clyde (Ref. 69). The paper deals with five years' working of fields of about 15 acres and gives a full account of all the operations involved and of the machinery used. Complete tables are given covering the man- and tractor-hours, and the fuel expenditure, per acre. The tractor used was a fairly old one of the general-purpose or row-crop type and totals of 16·15 man-hours, 11·50 tractor-hours, and 13·61 gallons of fuel per acre were required. The average yield was 436 bushels (about 8½ tons) per acre, and the total cost of the tractor work involved

was £3 15*s*. 0*d*. per acre. It is stated that the outstanding need at the moment is for a harvester which will lift and load the potatoes. An experimental one has been in use for 3 years and appears to be nearly what is wanted.

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FARM ECONOMICS.

I.—Landlord and Tenant.

1. *The Farm Agreement.*

The mutual obligations of landlord and tenant, which were defined in olden times by the Custom of the Country, then by Custom and the twenty-one years' Lease, and since 1884 by Custom, the Farm Agreement and the Agricultural Holdings Acts, have undergone more changes in recent years than either custom or the contract of tenancy or statute law have kept pace with.

It is not long since a definition of the course of cropping to be pursued on the holding was regarded as one of the most important of the contracts by the tenant. It represented the system of farming best suited to the locality and to the farm, as ascertained by long experience. On any well-managed estate, the Cropping Book, containing a yearly record of the cropping on each field of every farm on the estate, was regarded as supplying information essential to good estate management. And in the days when good agricultural practice was firmly established upon certain definite lines, it was a fair assumption that persistent cross-cropping would result in the deterioration of the holding.

The first challenge to this idea was the result of the progress of scientific research. Fertility, it was found, could be main-

tained without necessarily consuming on the land all the hay and straw made upon it, and high farming with fertilisers could bring the farm into a condition in which two successive white straw crops might be grown, or a crop of turnip seed taken, without the deterioration anticipated in the prohibition contained in the cropping clauses of many an old-time farm lease or agreement. Changes in the Custom of the Country obviously could not keep pace with the advance of knowledge, and changes in farm leases and agreements might not, and so, in 1906, an Agricultural Holdings Act was introduced which cut across both custom and contract and gave the tenant "freedom of cropping" except during the last year of the tenancy, when the farm had to be brought back into the course prescribed in the agreement. There is nothing on record to suggest that untoward results have followed upon this licence to tenants to crop their land as they think best. On the majority of farms, probably, tenants were content with the practice prescribed and desired no change, and even where the practice underwent modification, the farm had to be given up in rotation.

In some parts of the country, a new situation has arisen now, caused by changes in the economic situation rather than by technical or scientific advances. Whereas there was insistence on the cropping covenant in the last year of the tenancy, it is not uncommon to-day to find that its fulfilment is recoiling on the landlord and on his incoming tenant. In the first place, the introduction of sugar beet has led to substitution of this crop, on many farms, for a large part or even for the whole of the area devoted to roots and other fallow crops. In the second place, winter bullock-feeding has been so unprofitable that there has been a considerable decline in it. At the same time, the farm agreement, in those districts where the four-course system was followed and where farms change hands at Michaelmas, still prescribes that the arable land must be given up in the old rotation. This means that one quarter of the land in the light-land districts must be left in roots or fallow crops, and on the clay lands one eighth in roots and one eighth in bare fallow. Recently, cases have been reported in which arable farms in the eastern counties given up in the prescribed course, could only be re-let upon an undertaking by the landlord to pay for the roots, as the incoming tenant could see no chance of recovering his money at the prices prevailing for meat. So an investigation was made in Norfolk and Suffolk in the summer of 1933, to find out how this situation was being dealt with, and the results, which have not yet been published, are given here.

There was general agreement amongst land agents that the standard cropping clause still represented the best farming practice, and, with two exceptions, all those consulted during the investigation were retaining it in all their new tenancy agreements. At the same time, difficulties in re-letting led them to enter into arrangements with their outgoing tenants by which they should be allowed to cross-crop without penalty, in the last year, upon lines mutually agreed. The commonest arrangement is to allow the outgoing tenant to take a cash crop, usually barley or sugar beet, or both, the barley on some farms being underplanted with rotation grasses provided by the landlord. Where sugar beet is substituted, the right is reserved to the outgoing tenant to re-enter and harvest his crop at the proper season.

This is certainly the general practice. Landlords and their agents do not feel that the time has come to introduce a permanent change in the cropping covenant. Their attitude is that it still represents the best practice, and that the time must come again when it will be also the most profitable. In the meantime, on a change of tenancy, such arrangements are made with the outgoing tenant as will obviate the embarrassment of an expensive root break.

On two estates, however, a new cropping clause has been drafted for insertion in all fresh farm agreements. On one property, the clause prescribes that the tenant shall crop, in the last year of his tenancy, "according to the reasonable directions of the landlord, or in the four-course rotation". This leaves a landlord free to vary the standard practice if desired, while, on the other hand, the tenant is controlled by the alternative if no special arrangements are made. On the other property, the arrangement is much more definite. The tenant covenants "not to leave more than one eighth of the arable land in rotation roots, the remainder of the root break to be sown with corn or sugar beet". The outgoing tenant is given the right of entry on to the farm until the 20th December, to lift his beet crop, and the tops have to be left upon the land for the incomer without compensation. So much importance was attached to this change of practice that sitting tenants have been asked to sign an agreement substituting this covenant for the one under which they held.

The situation is worth more attention, perhaps, than it has received in those parts of the country having a Michaelmas entry. Farming practice has changed a good deal, and while it may be undesirable to base a legal contract upon what may prove to be no more than a passing necessity dictated by the economic depression, there is also the danger that the farm

agreement, unamended, may no longer reflect the best practice of the time.

2. *The Marketing Schemes.*

The relations of landlord and tenant are likely to be affected as the new policy for the control of agriculture is developed. In general, the policy, to be successful, must increase the returns from the land, and while there is no reason to suppose that anything spectacular will result, the tendency of land values and rents should be upwards. In particular, the marketing schemes are bound to affect localities and farms differently. The potato and hop quotas, for example, create situations the implications of which are obvious, and the pooling of milk prices, together with the guarantee of minimum prices for manufacturing milk, should give a fillip to dairying and to dairy farmers' profits in those regions producing mainly for the manufacturing market. These and other questions are discussed in two papers on the position of landowners under the agricultural marketing schemes, and their effect on tenant right (Refs. 1 and 2).

II.—Farm Management.

1. *Farming Costs.*

(*a*) *Crops.* Potatoes are one of the few important human foods in which this country is practically self-sufficient. Imports consist largely of new potatoes coming on the market before the home supplies are available, the competition from overseas in maincrop varieties being negligible. In the past, the potato acreage has shown itself very flexible, a season of high prices being followed by an increase of acreage and production which has reacted adversely upon prices. Growers are hoping much from the Potato Marketing Scheme, which gives powers to the Board to control not only the acreage planted but also the quantity of potatoes offered for sale.

Costs of this important crop have been studied for some time at the Midland Agricultural College. During the year, bulletins have been published showing the cost of production on a large number of farms in the East Midlands. Results are classified into earlies and maincrops and there is a further classification by soil types. The figures, which show a wide range of variation, have been compiled mainly for advisory purposes. The farmers who provided the data for the investigation can measure their own standard of performance in all the details of potato production—the cost of cultivations, manuring, lifting, etc., against those of other growers. Comparisons of this kind are valuable, for differences arrest the

attention, and while the investigation of, say, a manurial cost far in excess of the general average may sometimes prove that the farmer had his justification in an exceptionally heavy crop, the opposite may also be revealed and attention is thus directed to leakages in efficiency. The Midland studies are mainly of interest to the farmers concerned in them, and their application is limited to the districts to which they relate. But they bring out very clearly the importance of recording on the farm, whether it be labour costs, manurial costs, yields, marketing expenses, etc., if waste is to be detected and costs are to be lowered. (Refs. 3–6.)

Much has been heard of the various agricultural marketing schemes, and not everyone realises how much also has been done for the smaller, but very intensive branches of farming by means of protective duties imposed under the Import Duties Act. The Cornish broccoli growers are a group who have been thus benefited. The industry is a small one, but very important in its own locality. The acreage in Cornwall has shown a steady expansion every year since 1927, and whereas the acreage from all England has increased by about 50 per cent. since that year, in Cornwall it has increased by about 125 per cent., being second in extent only to the county of Kent, and these two counties produce about 40 per cent. of all the broccoli grown in England. A study of costs and prices in Cornwall was made at the Seale Hayne Agricultural College during the season 1932–33, which should be read by all growers for the market (Ref. 7). It would have been of great interest if a complementary inquiry could have been made at the same time in the County of Kent.

(*b*) *Livestock*. The launching of the Bacon Pigs Marketing Scheme has brought pigs and pig farming into prominence. One of the most interesting effects is the supremacy now conceded to the block test in determining quality, and farmers may have to modify some of their opinions of breeds and quality in the light of experience of the factory graders' scale of values. With a price for bacon pigs fixed at no fancy level, efficiency in breeding and feeding is essential to get the best results, and pig recording and economy in pig feeding are matters of prime importance. Information on each of these matters, useful to farmers working for the bacon market, will be found in a group of three articles published in the *Journal of the Ministry of Agriculture*. In the first of these, the results of the first year's working of the East Anglian Pig Recording Scheme are discussed. They show that the average age of pigs weighing 210 lb. was 250 days, whereas at the Rowett Research Institute, the same live weight was reached for all pigs in 205 days. It is fair to assume that the results at the Rowett Institute were

better than could be expected on the average commercial farm, but it is clear that careful selection of breeding stock based on records could do much on many farms to reduce the fattening period. Again, the average number of pigs weaned in the East Anglian Scheme was only 10·6 per sow year, a record which must leave room for considerable improvement. (Ref. 8).

In the second article, the question of pig feeding in winter and in summer is discussed from the financial standpoint. It is pointed out that in some parts of the country, particularly where farm-house cheese is made, pig feeding is regarded as a summer business, and the seasonal demand for stores in March, April and May tends to force up their price, while at the same time flooding of the September and October bacon market, which follows, reduces selling values in the autumn. The conclusion of the investigation is that where the better housing conditions which may be needed for winter feeding are available, farmers can look forward with confidence to embarking upon winter feeding as contrasted with summer feeding, when making contracts under the Bacon Marketing Scheme. (Ref. 9).

Many farmers prefer to cater for pig feeders by raising weaners rather than themselves to embark upon feeding, and there are others who breed the stock which they feed. To each of these, a knowledge of the cost of a weaner is valuable, to the former so that he may know the price he needs if his piglings are to pay him, to the latter, so that he may contrast the advantages of breeding or buying his stores. In the third article, the cost of the eight-weeks pig is given, the figures having been compiled from very careful records for a large herd kept at the Lord Wandsworth Agricultural College. It is impossible, of course, to give the cost of a weaner, for this depends upon the average number of pigs per sow per year, and the figures given, which range from 30s. for an average of 8 weaners per sow to 12s. for an average of 20, add point to the advocacy of the need for pig recording. Economical feeding exerts an influence, of course, on cost, but the prolificacy of the sow is of even greater importance. All things considered, however, the writer concludes that, given the right type of breeding stock, suitable accommodation, and reasonable efficiency in feeding, the Pig Reorganisation Commission estimate of 25s. as the cost of a weaner is at least reasonable. (Ref. 10).

(*c*) *Dairying*. The downward tendency of milk prices under the influence of higher production and the severe fall in the value of manufactured milk products has put a strain upon the dairy farmer's methods, which in some places is being resisted with difficulty. A scheme has been devised for testing the farmer's efficiency in certain factors of the cost of milk production, which is now being carried out by the provincial

advisory centres acting in concert. The matters which are being investigated include the cost of foods and labour in milk production, and the cost of herd replacement. The object of the work is to provide data for advice to farmers by showing them the variations in their own costs by contrast with those of other milk producers. In most provinces the work is still in its early days, but it has been proceeding for a longer time in one or two centres, and certain results have been published (Refs. 11–15). At Wye, for example, it is shown that it has been possible to secure a reduction in the quantity of foods fed per hundred gallons of milk produced during the winter period, and the farmers concerned in the work claim that this was due to the greater control of feeding which systematic recording makes possible. The variation in costs, too, of summer grazing was very striking, and suggests that "the grassland problem is not one of getting more grass, but of getting the fields into such a state that they will provide something more than maintenance". The inference is that the farmer's efforts towards the improvement of his grassland should be devoted more often to his best pastures, so as to cause them to yield a production as well as a maintenance ration, rather than to his worst pastures, which at best will give little more than a maintenance ration. (Ref. 11.) The importance of grassland as a cheap summer food for the dairy herd is also emphasised in two reports from Manchester (Refs. 13 and 14).

2. *Financial Results of Farming.*

Important as a knowledge of product costs is as an aid to farming efficiency, it is the general financial result of his whole business by which the farmer stands or falls. Reports upon the financial results of farming in several parts of the country were published during 1933.

(*a*) *Eastern Counties.* Perhaps the most important by reason of its scope was one issuing from Cambridge, which covered the eastern counties, from Norfolk to Essex. More than a thousand farms were included, and the figures published so far relate to about one half of them. The study of the figures is not complete, but the general conclusion for all farms is that an excess of income over expenditure was only attained by making an inadequate allowance for family labour and, even then, the net income did not represent a commercial return on the capital invested. The farmers' returns, however, mark a definite advance on those of the previous year, and suggest that agriculture in the eastern counties may have touched bottom in 1932. (Ref. 16.)

(*b*) *Dorset.* In the Blackmore Vale, in Dorset, dairying is probably the most important branch of farming pursued, and the results of the business have been studied at Reading for some time past, with a view to determining the conditions which influence profits. A report published on the results for the farming year 1932–3 (Ref. 17) shows that the most profitable farms were characterised by :—

(i) Their higher proportion of arable land.
(ii) A low ratio of expenditure per acre to receipts per acre.
(iii) A large gross output from the farm.
(iv) Low milk production costs, arising mainly from a high average milk yield per cow.

(*c*) *Devon and Cornwall.* Going further west, figures have been published by the Seale Hayne Agricultural College, summarising nine years' profits and losses on a group of mixed farms in Devon and Cornwall. Eighty farms are included in the survey, and the results are brought up to the end of the year 1931–2. The figures are rather depressing, as the period was one mainly of falling prices, but as the results given include capital losses, the farmers' cash position was a good deal better, probably, than appears at first sight. (Ref. 18.)

(*d*) *Scotland.* From Scotland comes a batch of similar reports on work undertaken at the Edinburgh and East of Scotland College. They relate to Border sheep farms, both arable and high-ground, to a group of large arable farms in the magnificent low-lying parts of the Lothians and to a few small holdings scattered throughout the south-eastern quarter of Scotland, most of which owe their existence to the land-settlement schemes of the Department of Agriculture for Scotland.

The low-ground Border sheep farms are large, averaging some 500 acres per farm, rented round about 25*s.* an acre. The farming is not intensive by comparison with some parts of East Lothian. The year 1931–2, to which the report relates, was a disastrous one, owing to the rapid and heavy fall in sheep prices, while costs relatively remained stable. The report notes that a recovery in prices is in prospect, and the position on these farms to-day must show a considerable recovery. The high-ground farms are larger, averaging nearly 1,000 acres, and the rent is little more than one half that of the low-ground farms. Crops are of very minor importance. But the financial results show the same general tendency. (Ref. 19.)

An interesting commentary on the extraordinary diversity of farming, even within geographical limits fairly narrow, is provided by a study of the foregoing reports and the one on 30 arable farms in the east of Scotland. The production of

wheat, barley, oats and potatoes accounts for about one half of this area. Crop yields are high, running up to seven and a half quarters of wheat, ten quarters of barley, thirteen quarters of oats and fourteen tons of potatoes in exceptional years. Rents range about £2 an acre, and the average capitalisation of the land is as high as £15. In the years 1929–30, 1930–31, half of the farms included in the study incurred losses, notwithstanding the high standard of production. Farming experience in these years was independent of the system of farming, for everywhere declining prices were realised, which were not offset by a proportionate decline in costs. As on the sheep farms, however, the year 1931–32 marked a definite recovery, and most of the farms showed a surplus. When some classification was attempted, the true East Lothian farms showed the best results. The surburban type in the neighbourhood of Edinburgh, which seem to have lost some of the economic advantage which they used to enjoy by their nearness to the market, before the development of motor transport, came next; then another group, in which the proportion of grassland is higher than on the more typical East Lothian farms, and where stock farming rather than crop production predominates. Thus it is of interest to note that the pendulum is swinging back to-day, and arable farming is coming into its own again under the assistance which it now enjoys. (Ref. 20.)

The report on Scottish small holdings is of value for the evidence it affords as to the labour income provided by these units of cultivation. The policy of land settlement is too often influenced by political and sentimental considerations. Nor is the only question that of the labour income, for it is common knowledge that the life itself has a value, even though it cannot be paid into the bank. In times of dwindling prices, such as those through which farming has been passing, the family farmer has a definite economic strength beyond that of his larger neighbour, in that he has no labour bill to meet each week, and while dwindling values may mean a lower standard of life, the fall may be considerable before the cash surplus becomes a deficiency. There are those who think that at a time like the present, when land is cheap and farm values are low and employment in rural districts is declining, the moment is opportune for an active land-settlement policy. Unfortunately, there is little guidance available in the form of evidence of the results of previous efforts, beyond general statements of rent payments and arrears published in official reports from time to time. It is this that makes the Scottish report of special interest, and a general investigation of the conditions of success on small holdings in all parts of the country would be timely. On the thirteen farms in the east of Scotland, no

deficits have been incurred in the last four years, although the margins have been declining. "Notwithstanding all the difficulties of the past year, there are still smallholders making well over £200 a year from 40 or 50 acres of land, as the fruits of their labour, their management and their savings." (Ref. 21.)

3. *Farm Management Surveys.*

(*a*) *Open Air Dairying.* In a good many parts of England, particularly on the light lands of the southern counties, the system of milk production introduced by Mr. A. J. Hosier on the Wiltshire Downs has obtained a firm hold. Though simple enough in its general conception, the practice of the system represents so great a departure from standard dairy technique that a thorough study of its organisation and its advantages and disadvantages seemed called for. This was carried out by the Agricultural Economics Research Institute during 1932, and the results were published last year. The system is too well known now to need description here. The evidence collected during the Oxford investigation led to the following conclusions :—

(i) Where there is no adequate cowshed on a farm, and the erection of a new one or the adaptation of an old one has to be faced, there is no doubt that the adoption of the milking bail, whether a fixed or a moving one, represents a saving and sometimes a very great saving. Even where the cows cannot lie out all the year round, a bail fixed on a concrete bed between two yards, through which the cows can be driven at milking time, is a great economy.

(ii) There is a flexibility about the bail which the cowshed lacks. The herd often can be increased in number without any increase in cowshed equipment, or if it is desired to reduce it, there is no half-empty cowshed representing idle capital.

(iii) Labour organisation on the farm is simplified, for each bail has its full-time labour complement, and no other labour is needed. At the same time, it should be noted that direct supervision by the farmer is more difficult, and this throws more than ordinary responsibility upon the cowman.

(iv) The incidence of tuberculosis and of most other diseases is lower in the average bail herd than in the average cowshed herd, but contagious abortion can be just as troublesome.

(v) Where cows are kept in the field all the year with a moving bail, production of clean milk is greatly facilitated.

(vi) The direct application of all food residues to the land, combined with the regular "hoof cultivation", has a markedly beneficial effect upon the quality of the herbage.

(vii) The costs of milk production are generally lower than under any other system, and more than compensate for the lower average yield which must usually be expected. Cows living rough in the open air must not be forced, but low costs and freedom from udder troubles are compensation for moderate yields.

The report gives a full account of the experience of farmers with the moving milking bail on all types of soils and also as a fixed installation in the farm buildings. Every farmer known to have purchased a bail, or to have constructed one, was visited during the course of the inquiry. (Ref. 22.)

(*b*) *The Strawberry Industry of South Hampshire.* Last year, in these pages, a reference was made to a report on the financial results of strawberry growing in South Hampshire, where the industry is concentrated in a comparatively small area between Winchester and Southampton Water, in the hands, for the most part, of a multitude of small growers. Here, some 2,300 acres are under cultivation with this crop, representing one tenth of the total acreage of strawberries grown in the country. The Agricultural Economics Department of Reading University has now issued a comprehensive report on the industry in this area, in which its history is traced from its earliest beginnings up to its development at the present day. Marketing practices, methods of grading and packing, and many other questions of importance to growers, not only in this area, are discussed, and the financial results experienced by growers given in the preliminary report is repeated. Strawberry growers in the Southampton area would do well to study this report upon their industry. (Ref. 23.)

4. *Special Studies.*

(*a*) *Farm Reorganisation.* For some years past it has been the practice of the Agricultural Economics Research Institute to study and to report upon particular farming enterprises which disclose marked originality in their technique or management, associated, of course, with financial success. Progressive farmers are to be found in every district, but here and there are men who are something more than this, and who demonstrate some new principle, either in farm practice or organisation. Mr. George Baylis with his system of continuous cropping without livestock is a case in point, and Mr. A. J. Hosier with his milking bail and other mechanical inventions

is another. The example selected for study by the Institute last year is that of a farmer in the Peterborough district, who has nothing very new, perhaps, to offer in the way of technique, but who provides a remarkable example of what can be achieved by replanning the farm not only as to its production for the market, but also as to its actual layout.

On the first point, the farmer, who had entered upon the farm at the end of the war and pursued the traditional local practice, was led by the evidence of costing to consider making radical alterations in it. Step by step, he changed from stock raising and feeding to dairying, and then from wholesaling his milk to retailing it, and so from the production of ordinary milk to graded milk. It led him from turnips and hurdle sheep to sugar beet and a grass flock, and from pigsties and the dung cart to pig folding and four-legged manure distributors. Above all, it led him from the principles of mixed husbandry to rigorous departmentalism.

On the second point, much work was done, as opportunity offered, in improving the farm for working by straightening some field boundaries and removing others, so as to get the fields into more workable form, and by the improvement and extension of the existing farm roads. When the decision to concentrate on the production of saleable crops, milk, and pigs was taken, the farm, as thus improved for working, was laid out in almost watertight compartments, so that the various enterprises could be carried on largely without interfering one with another. The dairy herd had its own fields ; the saleable crops, beet, potatoes, barley, wheat, seeds and kale, were worked on a six-course rotation in conjunction with the pigs, which were folded on the seeds and kale ; and similarly for the sheep. This segregation of farm production is associated with an equally rigid division of labour, each department having its full-time staff, so that over-lapping and coming-and-going between one part of the farm and another are eliminated. The whole story is good reading, and there is much in it which any farmer could study with profit. (Ref. 24.)

(*b*) *Horse and Tractor Power.* The final decision on the place of the tractor in the labour equipment of the farm has not yet been reached. That its use is extending is obvious, but neither the range nor the limitations of its usefulness can be ascertained so positively as, for example, in its application to road transport. Size of farm, soil conditions, the farming system, and other factors combine to prevent easy generalisations.

There is a good deal of statistical evidence available from various parts of the country, but most of it refers to

comparatively small samples. A recent study made in Central Illinois, in U.S.A., therefore, may be recommended to those interested in the question of horse power and tractor power on the farm, for it is based upon the accounts of more than 1,500 farms. The conclusions are that variations in the form of power from farm to farm are not inconsistent with good farming practice, representing often adjustments necessary to individual circumstances. On the other hand, they are often due, also, to personal preferences and the financial resources of the farmer. The conclusions are that tractors were invariably associated with the larger farms. The saving in manual labour on tractor-operated farms was only slight except on large grain farms. On farms where much of the labour was provided by the family, the substitution of tractors was found to increase the leisure time of the farmer, but while this may be an advantage on this type of holding, it presents difficulties where much of the labour is hired. Men want a full day's work for full wages, rather than the opportunity of doing nothing at their own expense. The interesting comment is made that whether the farms were all-tractor, or all-horse, or tractor-and-horse combined, the variations between individual operation costs were so wide that there was clearly room for the exercise of much greater efficiency by the better use of the power already on the farm, whatever its nature. (Ref. 25.)

III.—Marketing, Prices and Supplies.

Systems of marketing are undergoing modifications in some commodities, following the formation of marketing boards, and prices are also coming under control, but the work of the Boards, as such, seems hardly to fall within the scope of this annual review of farm economics. They are still in their infancy, however, and much investigation and study of their operations will be needed if they are to give their maximum service to the community. In other spheres a good deal of miscellaneous investigation has been carried on in the past year.

1. *Crops.*

A remarkable survey of the production and marketing of barley in the principal exporting and importing countries of the world emanated from the now defunct Empire Marketing Board last year. The report is not a handbook for farmers, but it may be recommended to students of the barley trade. (Ref. 26.)

From the Scottish Department of Agriculture comes a report on the marketing of potatoes in Scotland. It remains to be seen how much the operations of the Potato Marketing Board will affect prevailing practices. (Ref. 27.)

2. *Livestock.*

It is well known that some parts of the country have an exportable surplus of livestock, whilst others have a deficiency which must be met by purchase from outside. The counties of Devon and Cornwall are in the former category, and a study of their livestock markets has been made at the Seale Hayne Agricultural College. The two things which emerge from it are the importance of the trade to the farmers of these counties and the multiplicity of little markets concerned in it. Whether these make for efficiency in distribution may well be doubted. On the other hand, store stock raising is often the hill farmer's occupation, and his access to distant markets is limited. The movements of store stock after leaving their place of origin are followed in this survey to a certain distance, but the ultimate destination could not be determined. (Ref. 28.)

A report on the marketing of livestock in Scotland was issued by the Scottish Department (Ref. 29).

3. *Dairying.*

The Cambridge Farm Economics Branch is responsible for a survey of Milk Marketing Schemes and Price Policies, a work of importance in the application of scientific method to the examination of agricultural organisation. It is written for the student rather than for the farmer. (Ref. 30.)

In another dairying study, made at the Agricultural Economics Research Institute, the effect of the supplies of butter and cheese on the prices of surplus milk is considered, and the conclusion is reached that the effects of supply restriction, within practicable limits, can raise the price of manufacturing milk in this country but very little, for the ultimate controlling factor is the consumer's purchasing power (Ref. 31).

IV.—Miscellaneous.

1. *Co-operation.*

The organisation of agriculture under the Agricultural Marketing Acts seems to have gone a long way towards achieving, with a certain amount of compulsion, that which the advocates of agricultural co-operation attempted, with only partial success, to organise on a voluntary basis. In the meantime, however, co-operative supply societies are unaffected, and certain market organisations, such as egg packing stations, have not yet been superseded. Certain reports on co-operative enterprise of interest to farmers will be found in the Bibliography (Refs. 32–34).

2. *The Agricultural Register.*

Although not published until after the close of the year, this publication may be included here because it relates to the events of 1933. The Register was compiled at the Agricultural Economics Research Institute and it contains a comprehensive summary of the agricultural history of the year, including the Agricultural Marketing Act and other legislation ; the Marketing Commissions, Schemes and Boards set up or produced ; enactments under the Imports Duties Act ; a record of agricultural wage changes ; a discussion of the tithe question, and other matters. The book may be regarded as a work of reference and a handbook of contemporary agricultural history. (Ref. 35.)

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DAIRY FARMING AND DAIRY WORK.

I.—The Milk Marketing Scheme.

To dairy farmers the chief event of general interest in 1933 was the adoption of Milk Marketing Schemes and the formation of Milk Marketing Boards in England and Wales and in Scotland. This review is not directly concerned with the economic and other causes which led to this momentous change in the farmer's methods of milk selling, but, as the work of the Milk Marketing Boards will have most important and far-reaching effects on the future production and sale of milk and farm dairy produce, it appears desirable that some brief reference should be made to the more important publications which have been issued in connexion with the Scheme.

In April, 1932, the Minister of Agriculture, under the Agricultural Marketing Act of 1931, appointed a Milk Reorganisation Commission under the Chairmanship of Sir Edward Grigg to prepare, in accordance with the provisions of the Act, a scheme or schemes, applicable to England and Wales, for regulating the marketing of milk. This commission issued its report early in 1933 (Ref. 1). It recommended the formation of a Central Producers' Board, a Central Dairymen's and Manufacturers' Board and a Joint Milk Council. Included as an appendix to the report was a draft scheme for regulating the marketing of milk. The report also contained much valuable information on the production and distribution of milk, and recommendations were made on a price policy based on a system of regional pools for milk for liquid consumption and for manufacturing purposes, on improvements in the quality of milk and revision of the official grades, on the

development of the manufacture of primary and secondary dairy products and on other points.

The Agricultural Marketing Act, 1931, contained the provision that a Marketing Scheme must be sponsored by persons substantially representative of the producers of the product in the area to which the scheme is applicable and, as the National Farmers' Union was the only body which could claim to meet this definition, the Union prepared and issued in March, 1933, a Marketing Scheme (Ref. 2) based generally on Appendix A of the Reorganisation Commission's Report. This scheme included the formation of a Producers' Board with regional committees. It did not include the formation of a Dairymen's and Manufacturers' Board, nor of a Central Milk Council, as the establishment of these bodies required fresh legislation, and the uncertainty about the future of milk prices required that the Scheme should come into operation by October 1st, 1933, if at all possible.

In June, 1933, a public inquiry was held on objections lodged against the Scheme by bodies representing various interests. The official report on this inquiry was made privately to the Minister of Agriculture.

After consideration and approval of a slightly revised scheme by the Houses of Parliament, the Milk Marketing Scheme (Approval) Order, 1933, was issued by the Ministry of Agriculture in July (Ref. 3). Following on the issue of this Order the question whether the Scheme should or should not come into operation had to be decided (according to the Agricultural Marketing Act, 1931) by the votes of the registered milk producers, and a two-thirds majority of those registered, having reference to numbers and output, was necessary to secure adoption of the Scheme. The poll was taken at the end of August when 89·25 per cent. of the registered producers voted and, of these, 96·42 per cent. voted for the Scheme.

The Scheme was therefore adopted and the above-mentioned Order provides the basis for the work of the Milk Marketing Board. Under it the Board of 1933 was constituted, a general manager and other staff appointed, offices obtained, and prices for the ensuing winter agreed with representatives of the milk buyers. The sale of milk under contracts drawn up by the Board was begun in October.

The report for the first month's work showed that 70,000 contracts had been made with producers, that 50,000 producer-retailers had been licensed, and that the accounts covered some 47,000,000 gallons of milk.

That an organisation of such a magnitude could be brought into existence in so short a time was a marvellous achievement. In some instances farmers were dissatisfied with the price

ultimately received for their milk; in some rural districts the price of milk to the consumer was raised unduly, and it became clear that the future of farm cheesemaking had received insufficient consideration. On the other hand, the position of producers was organised and greatly strengthened and much disastrous undercutting was prevented. On the whole the Milk Marketing Scheme made an excellent start in a surprisingly short time. Many of the difficulties of 1933 will no doubt be solved in 1934.

In the course of 1933 it was recognised that the schemes prepared under the 1931 Agricultural Marketing Act would not be able to attain the ends desired so long as the home market was in danger of being demoralised by the unregulated flow of imported supplies. From the dairying point of view, a fair price for milk for liquid consumption could not be maintained unless milk used for cheesemaking also brought a fair return; and the price of British cheese could not be maintained if the home market could be flooded with cheese from abroad, produced under more favourable climatic and economic conditions. It became necessary to give producers some assurance that effective steps would be taken, where necessary and practicable, to control the flow of imported produce and that in the future a general system of supply regulation, including regulation of imports and providing for the steady expansion of home supplies, would be adopted. Action with regard to imports from the Dominions could only be taken within the limits of the Ottawa Agreements Act, 1932, but the need for additional legislation was recognised and this took the form of the Agricultural Marketing Act, 1933 (Refs. 4 and 5). This Act provides for the ultimate regulation of imports and home supplies, for development schemes and for amendments to the Act of 1931; nevertheless, early in 1934, it became clear that emergency measures were necessary if farm cheesemaking in England and Wales was to continue to exist. It was seen that unless immediate action was taken to maintain cheesemaking, the milk usually made into cheese on farms would be placed in the hands of the Milk Board for disposal, and the whole structure of the Milk Marketing Scheme would be in danger of collapse. Action took the form of an announcement, in February, by the Minister of Agriculture that the Government would give financial assistance to the Milk Board for two years from April 1st, 1934, in order to maintain minimum prices of 5*d.* per gallon in summer and 6*d.* per gallon in winter for milk made into cheese in factories and on farms.

The Minister also announced that for the purpose of launching a campaign for securing a purer milk supply, £750,000 would be provided from public funds, to be spread

over the next four years, and that the Government was prepared to contribute on a pound-for-pound basis to a milk publicity fund for a period of two years; the Government contribution to be limited to £500,000 in either year according to the amount contributed by the Milk Marketing Boards, and the grant to be contingent on the submission of an approved programme, including the provision of milk to schools at reduced rates. The legislation to give effect to the above announcements is embodied in the Milk Act which was passed by the Houses of Parliament in July, 1934 (Ref. 6).

The advent of Marketing Acts and Schemes has, to an increasing degree, directed the attention of farmers and farming societies to marketing problems. Progress in this direction was undoubtedly necessary but it should be realised that educational work is still required to help farmers to produce, economically, goods of higher and more uniform quality; and research work will be needed to solve the difficulties which arise in the production and sale of standardised and graded produce. A long-range policy, embodying economical production, successful marketing and all-round improvements in the quality of milk and dairy produce, will require help in many directions from those engaged in agricultural education and research.

II.—Dairy Farming Practice.

The Open Air or Bail System.

During the last fifty years there has been a marked increase in the number of farms taking up the practice of milk production. The systems of management and housing adopted on the majority of these farms have been, on the whole, similar to those which were followed on other milk producing farms in the respective districts, and it was only in rare instances that any really new development was introduced. During the last ten years, however, a new system of open air management has been devised and put into practice in a number of counties. The inauguration of this system is mainly due to Mr. A. J. Hosier of Wexcombe in East Wiltshire, and his methods have been described in several publications (Refs. 7, 8). Farmers in other counties have taken up the system. Dixey and Messer, of the Agricultural Economics Research Institute at Oxford, have made a survey of these farms and published an interesting report on their findings (Ref. 9). Records were obtained from 86 farms distributed over 17 counties and details are given on numerous points of practical interest to those following this system and to others who may be contemplating its adoption.

The essential features of the system are the maintenance of a herd of milking heifers or cows—usually some 60 to 70 in number—on a large range of pasture, day and night, summer and winter, and the milking of the herd by a milking machine built into a wooden structure or "bail" which can be moved at will to a fresh site in the field. Concentrates can be given to each cow at milking time and hay, roots or other green foods are given on the pasture when necessary. The system lessens the cost of milk production by reason of the savings in the cost of housing, in the labour of cleaning cowsheds, removal of manure and milking.

The report referred to shortly describes the soil and climatic conditions under which the system is practised. A comparison is given of the cost of a new cowshed, with a milking machine, and that of a bail and its equipment. This may be condensed to the statement that the capital charges per cow-place per annum in the former will amount to *56s. 6d.* whereas in the latter they will amount to *23s. 4d.* The bail system thus offers a saving of up to 59 per cent. in the capital charges for housing and milking equipment. On a number of farms the bails are placed in a permanent position throughout the year and on others a fixed position is occupied only for the winter months. The chief reason for taking the bails off the pasture, permanently or temporarily, is to avoid too much "poaching" of the land, and in some instances the need for more efficient cooling of the milk was a further consideration. In addition to statements as to the original cost of bail outfits, the chief causes of deterioration and of breakdown, and the estimated costs of upkeep and operation, are given and discussed. Costs of upkeep and operation appear to be so variable, owing to variations in the local conditions, that no useful summary can be given here. Farmers interested should consult the original report.[1]

The herds of cows on the farms dealt with in this survey were predominantly of Shorthorn type and almost half the Shorthorns were of Irish origin, but there were also several herds of Ayrshires and a few of Guernseys, Friesians and other breeds. Broadly speaking, the herds could be divided into two groups according to the owners' method of drafting cows out of their herds. One group comprised owners who sold their cows as down-calvers after one, two or three lactations, and in the other group the cows were kept until they were of no further use as milkers. In the first group the herd was most frequently replenished by the purchase of Irish heifers

[1] Other points in the report are dealt with under Farm Economics, p. 251.

and in the second group by the introduction of home-bred heifers. In respect of health, there was a general opinion that the bail herds had a higher health standard than housed herds, but in this connexion it is necessary to remember that ailments in the early stages are not so likely to be detected under the bail system. The need for an interested and observant cowman is at least as great under bail as under ordinary conditions.

Particulars of the average milk yields were obtained from 18 herds; for 10 herds replenished by purchase of heifers, the average is given as 438 gallons, and for 8 herds replenished mainly by home-bred heifers it is 495 gallons. These averages must be considered in relation to the method by which they are calculated; the method was to take the total quantity of milk produced by each herd in a year and to divide it by the average number of cows in the herd for the year; and it is pointed out that, where the system of management is to sell cows after one lactation in order to avoid carrying them during their dry periods, the herd average calculated on the above method will be higher than on farms where cows are maintained for more than one lactation. All the farms included in the above averages were carrying a proportion of dry cows. A comparison of milk yields is also attempted between bail herds and herds kept on the usual outdoor-summer and indoor-winter system and the conclusion is that 19 bail herds yielded less than the corresponding indoor herds; 3 yielded more and 7 yielded on the same level.

An attempt was also made to obtain information on the quality of the milk produced but actual details of comparative bacterial content and keeping qualities are lacking. The open-air system has definite advantages in that there are no buildings to keep clean and the cows themselves are cleaner; also the use of a milking machine prevents contamination by visible dirt. On the other hand, the facilities for washing and sterilising the parts of the machine which come in contact with the milk are often less good and the cooling of the milk to a sufficiently low temperature during the summer may be more difficult. Where water only is relied on for cooling purposes it may be exceedingly difficult to produce milk of good keeping quality at the time of year when such a milk is most necessary. If a brine-cooling or direct-expansion cooling plant can be added economically to a bail outfit this difficulty should be effectively overcome.

One of the main advantages of the bail system is the reduction in the labour cost of milk production which is rendered possible. Practical experience has shown that a herd of 60 to 70 cows can be attended throughout the year by one cowman and a boy—this staff receives no assistance from other

farm labour and gives none to other farm work except at hay-making time. Information on labour costs was obtained from 11 farms and the average cost per gallon was found to be 1·73 pence, with a range of from 1·20 pence to 2·35 pence per gallon. Enquiry into the conditions under which the work was performed led to the conclusion that, practically without exception, the men preferred out-door milking. This preference appeared to have a wide and varied basis ; weather conditions were not so boisterous as might be expected ; continual work out of doors was preferable to half out and half in ; a greater independence and sense of responsibility was developed and the hours and the work were somewhat lighter, particularly on Sundays. The herd owners were agreed that the bail system does not afford so many opportunities for personal supervision as the usual system and that, therefore, the most important attribute of the cowman in charge is trustworthiness.

The report also gives valuable information on the suitability of the system for different types of soil, its effect on different types of pasture and the quantities of foods given to supplement the pasture. The chief limitation to the spread of the system is the type of soil, but marked differences of opinion were expressed as to the degree of " poaching " which is really harmful. In addition to the damage to the turf (whether recovery be quick or slow) there is general agreement that a wet soil is harmful to the cows. The report ends with the following sentence—" The evidence is insufficient, at present, to admit of a final pronouncement upon the open air system, for the range of its application and its adaptability cannot yet be defined. But sufficient has emerged to suggest that dairy farmers might do well to consider whether in many places the future of dairy farming does not lie in the adoption of the simpler methods which characterise bail milking ".

Control of Feeding.

Another interesting report dealing with an important aspect of dairy farm management is that written by Knox and published by the South-Eastern Agricultural College (Ref. 10). The title of this report is " Food Recording and Cheaper Milk Production " and the subject matter is the information collected during the three years' operation of a Food Recording Scheme in Kent and Surrey. It is explained that earlier studies of milk production had shown that there was occasionally a wide difference between the quantities of foodstuffs which the farmer *thought* were being fed and the quantities that were actually fed ; differences of 15 to 20 per cent. were found to be quite common. The first object of the scheme was, therefore, to determine whether it was possible

and practicable to control the consumption of foodstuffs on the farm just as the consumption of raw materials is controlled in a factory. The second object was to measure as accurately as possible the various quantities of foodstuffs consumed, on different farms, per 100 gallons of milk produced.

It is claimed that experience has shown that the necessary control of foods is both possible and practicable, always provided that the management is willing to take a little extra trouble. Purchased foods and home-grown corn can be checked with accuracy and one instance is mentioned where only 4 cwt. was unaccounted for in a total of 183 tons fed over a period of thirty-one weeks. The bulky home-grown foods cannot be controlled with the same degree of accuracy, but knowledge can replace guess-work if for instance mangolds are handled in measures which are weighed from time to time, and the total is checked against the estimated yield per acre or contents of the clamp; or again if the hay is trussed, and regular checks on the weight of the trusses are followed up by a final check against the estimated contents of the stack.

The measurement of the quantities of the different foodstuffs consumed per 100 gallons of milk involved calculations of the estimated nutritive values of foods of different composition. In order to arrive at a common basis of valuation, the total starch equivalent of the concentrates and bulky fodder consumed on the different farms was calculated, and the value of the grazing and soiling crops given was stated in cash. Comparisons of the returns from different farms, on the above bases, showed marked variations. The extremes were 366 lb. starch equivalent plus 6*s*. 2*d*. worth of grazing per 100 gallons of milk to 730 lb. starch equivalent plus 7*s*. 5*d*. worth of grazing per 100 gallons. Taking the winter period alone, the starch equivalent consumed per 100 gallons of milk varied from 1,039 lb. to 474 lb. on different farms. On a group of nine farms where the food-recording scheme was in operation for three successive years, it was found possible to lower the starch equivalent consumption per 100 gallons of milk by 10 per cent., and the author suggests that for the winter period of October to April the starch equivalent consumed per 100 gallons of milk should not exceed 600 lb.

The report also discusses the relationship between food consumption and herd yield, the choice of foods for winter and summer, and cost of herd depreciation. It is shown that, on the average of thirty farms in the two counties, some 41 per cent. of the nutritive value of the ration was obtained from purchased concentrates, 47 per cent. from home-grown foods and the balance from other foods used in small quantities or used on some farms and not on others. Hay supplied 27 per

cent. of the food value of the winter rations and the importance of obtaining a good quality of hay, and of controlling its use, is rightly stressed. To farmers who do not have the opportunity of taking part in such a scheme, the main lessons to be derived are that there is often a wide divergence between the quantities of food *intended* or *reported* to be given to the cows and the amount *actually* given, and that by using simple control measures the rationing of the cows can be done both more accurately and at a less cost.

Points in Cowshed Construction.

A study of the temperatures of cowsheds has been conducted in the United States (Ref. 11). In these tests ventilation was regulated so as to aid in maintaining the desired temperatures and at the same time to avoid bad air conditions in the cowshed. On several occasions excessive draughts resulted when an attempt was made to keep the cowshed temperatures lower than the outside conditions warranted. As the results of these excessive draughts several cases of pneumonia developed. In a comparison of cows housed at temperatures ranging by 5° differences from 40°F. to 60° F., those maintained at 50° to 55° were more alert, with eyes brighter, hair more glossy and the appetite good, while those maintained at a temperature of 60° to 65° stood with ears back, were more restless, had harsh hair, were harder to clean and had less appetite. At the higher temperature odours were more noticeable, and health inspectors objected to these. The milkers all preferred the cooler temperature.

No mention is made of the effect of these different temperatures upon the yield and quality of the milk. The results obtained in a somewhat similar experiment carried out as long ago as 1908 and 1909 by the Highland and Agricultural Society of Scotland are worth quoting (Ref. 12). In the winter of 1908–9 two similar lots of cows on five farms in different parts of Scotland were fed and housed alike, except that the byres containing one half of the cows were freely ventilated in all weathers, so that the air was more often renewed and the temperature kept lower than in the other byres, where ventilation was so restricted that the temperature was maintained some 10° higher. The following is a summary of the results :—

YIELDS OF MILK UNDER FREE AND RESTRICTED VENTILATION.

	Free Ventilation.	Restricted Ventilation.
Average temperature	49·8°F.	59·4°F.
Number of cows (total of 5 farms)	50	50
Average daily milk yield per cow	27·5 lb.	27·3 lb.
Average percentage of fat	3·55	3·49

A similar series of experiments in the following winter confirmed the above results.

Fowler, of the Hannah Dairy Research Institute, Ayr, continuing his study of the construction and equipment of cowsheds, deals with automatic water bowls in cow stalls (Ref. 13). Bowls of the gravity-feed type and the pressure-feed type are reported on. The former have the advantage of simplicity of construction and lower cost. A definite disadvantage however is that it is very difficult to keep the water in these bowls clean and wholesome, since morsels of food are frequently dropped into them by the cows, and these ferment and may even block the feed pipe.

The pressure-feed bowls are made in different shapes and sizes but the method of obtaining water is usually the exertion of pressure by the animal's nose or lower jaw on a hinged tongue which connects with a spring valve fitted into the inlet pipe. In this system the water may be taken direct from a main supply provided the pressure on the pipes does not exceed 15 to 20 lb. per square inch. A higher pressure results in a noisy "hammering" of the valve when the tongue is depressed. To avoid this it may be necessary to fit a supply tank some 15 feet above the floor level.

On the subject of the shape and capacity of bowls of this type, Fowler states that any shape which hinders the natural movement of the cow's lower jaw when drinking is unsatisfactory, and that placing the metal tongue along, though above, the floor of the bowl, prevents the cow from drinking in comfort and tends to the sucking of air as well as the drinking of water; further, the space under the tongue collects particles of food, such as meal, cake, roots or fodder and constant cleaning is needed to maintain free action of the tongue and a clean supply of water. It is suggested that a bowl of elongated shape, giving greater freedom for jaw movements, and with the hinged tongue in an almost perpendicular position at the back of the bowl, where it can be operated by the cow's nose, gives greatest satisfaction. Bowls of this type can also be fixed at a higher level, whereby the risk of contamination from food is lessened because the animal's head is not perpendicular when exerting pressure on the metal tongue. Where one bowl is to serve two animals it is suggested the bowl should be placed between two adjacent stalls instead of in the middle of one stall.

The materials of which bowls are made was also studied and it was noted that the inner surfaces of bowls made of galvanised iron, galvanised pressed steel or even chromium-plated cast iron became corroded. A porcelain-enamelled, cast-iron bowl proved satisfactory in resisting the corroding effect, but chipping of the enamel was troublesome. A non-

chipable enamel has, however, been used and proved to be highly satisfactory.

One type of pressure bowl has also been tested and reported on by the Agricultural Machinery Testing Committee of the Ministry of Agriculture (Ref. 14). The test was carried out at the National Institute for Research in Dairying, Reading. This type of bowl is made of galvanised cast iron and is so constructed that pressure on the front portion of the bowl raises the rear portion, which in turn lifts the valve-rod and allows water to enter. No metal tongue is required. A guard-ring is provided, which surrounds the bowl. The report states that when the bowls under test were connected with the existing water supply, which had a head of about 50 feet, water overflowed from the bowls into the mangers underneath. When the head was reduced to approximately 6 feet by the introduction of a supplementary cistern no further overflowing occurred. In another test, when the head of water did not exceed 20 feet, no splashing occurred and there was no undue "water hammer." The bowls were easily cleaned owing to the absence of any working parts inside them, and neither milking cows nor yearlings appeared to have any difficulty in obtaining a supply of water when they needed it.

III.—Dairy Cattle—Type, Breeding and Management.

Type in Relation to Production.

One of the features of the application of scientific methods to the study of farming problems has been the attempt to find the true reason underlying common beliefs and practices. Sometimes these practices have been found to have no rational basis, sometimes they have been found to be useful, but for reasons differing from those commonly given in support, and sometimes the practice in question is so wide in its application and so difficult of measurement and definition that it continues despite adverse criticism from certain points of view.

The probable value of a cow for dairy purposes has been judged, for many generations, by the external appearance or conformation of the individual animal and with the advent of score cards and judging competitions, attempts have been made to give reasons why certain points of conformation are considered "good" and others "bad". The anatomist, the physiologist and the statistician have each tried to test the opinions of the practical judge, and though work of this nature continues to receive much attention, the subject can be viewed from so many different angles that there is no prospect of finality being reached in the near future.

Gowen (Ref. 15) has studied the subject, using as data measurements of American Jersey cattle of which the milk- and fat-yields and the fat percentage were also known. He comes to the conclusion that in this breed, and also in the American Holstein-Friesian breed, live weight has a definite influence on quantity of production—the larger the cow the larger her probable production. Body measurements such as height at withers, heart girth, paunch girth, width at hips, body length and rump length taken individually are of little value as indicators of production, and neither live weight nor any other point of conformation is of any value as an indication of the percentage of fat in the milk. When the measurements are considered as a whole, thereby giving a more complete picture of the external appearance of the cow, weight again is the most valuable indicator. Gowen also suggests that a relatively small heart girth (for size and age) is a feature of high producers, *i.e.*, the cow should show the wedge form when viewed from the front. He points out that the beef cow, in contrast to the dairy cow, is noted for its lack of a point at the withers ; it is broad and blocky in this region. The dairy cow, on the other hand, has but little covering of flesh on the withers ; her food does not seem to make flesh ; it seems rather to be used by the udder and converted into milk. There is a specific difference in the animal's internal physiology which may be observed in her external appearance.

Gowen also makes a comparison between the different methods by which it is possible to estimate the probable future production of a cow. These are (a) the cow's conformation in relation to her age, (b) a previous milk record of any length and (c) her heredity for milk secretion. He concludes that in respect of milk yield, her heredity, as shown by the production records of her ancestors, has five times, and a previous lactation record has fully three times, the value of conformation as an indication of future yield, while in respect of butter fat percentage, heredity has twenty times, and a previous lactation record seventeen times, the value of conformation. Conformation, therefore, is of little comparative value as an indicator of future production but attention should be given to the following points—the cow should be above the average weight for her breed and age, she should be of good wedge-shaped form particularly in the region of the shoulders, her milk veins should be of good size and her udder should be of good size and quality. Gowen draws attention to the point that a larger body requires more food for maintenance and that, from the economic standpoint, size must be considered in relation to economy of production.

It would be unwise to leave the above comments on conformation without drawing attention to some omissions. In practical dairy farming, healthy cows are as necessary as good producers and no attempts seem to have been made to discover the relationship between conformation, milk production and health. Also no special study appears to have been made of the relationship between shape of udder and the incidence of udder troubles.

These points, as well as the quantities of food required by animals of different live weights, have a real bearing on the economics of milk production and until definite information is available the dairy farmer must still use his powers of observation and judgement, strengthened with all the knowledge he can obtain.

Inheritance of Milking Capacity.

A great increase of interest in breeding for better milk production has been a feature of recent years. It has been exceedingly difficult to obtain a general summary of the experimental and observational work which has been carried out in different countries, and attempts to study some of the more detailed reports are likely to discourage the lay reader by reason of the use of language with which he is not familiar.

An attempt has been made by Buchanan Smith and Robison (Ref. 16) to present a critical summary of the results of investigations into this subject but they point out that the reader who seeks information of immediate usefulness in practice may be disappointed; even after thirty years of research it has not been possible to arrive at definite conclusions. Nevertheless, keen students of the breeding of dairy cattle for production will find much interesting information on such subjects as the progeny test, inbreeding, the relative importance of sire and dam, and the possibility of sex-linked factors. One statement, however, that the colour of milk appears to be more influenced by breed than by nutrition, needs qualification or correction in view of the work on carotin and the experience of all dairy farmers every spring and summer.

The authors give an extensive list of reports on experiments, etc., which should be of great value to other students of this subject.

Progeny Testing of Dairy Bulls.

It is now generally recognised that the breeding value of a sire can be judged most reliably by the qualities of his offspring. With regard to bulls of dairy breeds, qualities of milk- and fat-yield must be taken into account as well as qualities of breed, type and conformation. There is a steady output of articles

dealing with the interpretation of such yields and the construction of an arithmetical method of measuring or stating the sire's dairy qualities.

Lush, of the Iowa State College, in an article (Ref. 17) on the "Bull-index Problem" discusses the genetic principles which govern or control the interpretation of data on which an index is based. In a short survey of the principles of heredity he points out that it is a practical impossibility to dissociate an animal's inherited power for milk- or fat-production from the conditions under which it lives. "The inheritance which would be for 800 lb. of fat under one set of conditions might just as well be called inheritance for 600 lb. of fat under another set of conditions." He also states that the genetic fact of major importance, in the interpretation of a bull's breeding value or the formation of a bull index, is that offspring are, *on the average*, midway between their two parents but that individual offspring may vary widely from that average. He also recognises the result known by the practical breeder as "nicking", where the offspring of a bull and one or more cows are found to be superior to the offspring of the same bull and other apparently similar cows.

In a discussion of the different bull indices which have been suggested he points out that no one index is as yet entirely satisfactory, but the weaknesses of one are not the weaknesses of another. Almost all indices are based on the average production of an unselected group of daughters but they vary in the use made of the increases or decreases shown by the daughters' yields over or under those of their dams. One suggested index which is based solely on the difference between the average of the daughters and the average of their dams is dismissed with the comment that it "has so many theoretical and practical unsoundnesses that it no longer seems worth discussion".

Lush emphasises that the records used should be absolutely unselected, or selected by some method which is not influenced by the magnitude of the records. This applies both to the number of the daughters' records available, and to the records of both daughter and dam in successive lactations where these are available. He adds that one of the points in favour of an index based on the daughters' average alone, is that it is more difficult to load the dice by selecting high records in one place and low records in another; also that the use of the first-lactation records of daughters (or daughters and dams) has the advantage of making the index figure available at an earlier date in the sire's life. Lush adds that "if indices become popular and acquire any considerable commercial value, the matter of ensuring that the records used shall not be selected

by some biased method, will become quite important. This will be more important if the index eventually adopted is one that takes into account the dam's record than if it is the daughter's average alone". In his conclusion he states that no bull index can be regarded as infallible because the sources of error cannot be absolutely eliminated. The sources of error should be minimised as much as possible and the more one knows about the conditions under which the daughters' and the dams' records were made, by that extent the errors can be reduced. Lush recommends the "equal parent index" (the average for the daughters plus the increase of the daughters over their dams) as soundest in principle, simple enough for field use, freest from systematic error and, expressed in yield figures, not very different from those of the actual records of cows.

Another aspect of the progeny testing of dairy bulls is dealt with by Mackintosh (Ref. 18). In this article the breeding history of four bulls in the herd of the National Institute for Research in Dairying is given, all the calves born being accounted for and the fate of all the female calves specified under classified headings. It is shown that out of 260 calves sired by the four bulls, 136 were males and 124 were females; of this latter number, 8 were born dead, 2 died between birth and calving, 21 were sold before service and 93 were kept for breeding; of these 93, 6 failed to breed, hence 87 out of the 124 female calves (or 70 per cent.) ultimately had calves themselves. In other words, 10 cow calves were required to give 7 calved heifers, and out of every 10 calves born—male and female—3½ were ultimately available for herd maintenance. The analysis also shows that of the 87 heifers which had calves, 5 were sold at calving and 19 were not recorded for the full first lactation, leaving 63 available for the second lactation. This summary deals with the results for all four bulls taken together, but the article gives details for each bull.

The performance of each heifer for her first lactation period not exceeding 315 days—in terms of milk-yield, fat and solids-not-fat percentage—is also given, and there is a discussion of the extent to which the conditions of herd management bear on the reliability and interpretation of the progeny records. A set of age-correction factors for milk is given for daughters of three of the four bulls and, when the maturity yields calculated by these factors are compared with the actual yields obtained in the fourth, fifth and sixth lactations (where these are available), it is shown that the difference is less than two per cent. When the progeny groups for each individual bull are studied, however, it is shown that with one bull, the actual maturity yields are some 16 per cent. higher than the

calculated yields; with the second bull the difference is less than 1 per cent. and with the third bull the actual maturity yields are 9 per cent. less than the calculated yields. These results illustrate that the progeny of different bulls come to maturity in milk production at different rates. The set of age-correction factors gives reliable results on the *average*, but the calculated mature yield may be, for individual animals, so far out as to be seriously misleading.

In another table the average production of groups of daughters of each bull in order of calving is given. This table shows how successive groups of six daughters compare, and how each group compares with the average for all the daughters; it also gives the number of daughters, calving within the same periods of time, which were sold at calving or did not complete their first lactation periods. Because the contents of this table have a definite and practical bearing on the interpretation of progeny-test records, it is given below.

Average Production of Groups of Daughters in Order of Calving.

Sire	Group of Daughters completing 1st Lact. Pd.		Average Production of Groups of Daughters. Actual Milk Yield.	Age-Corrected Milk Yield.	Actual Fat Percentage.	Actual Weight of Fat.	Actual Percentage of Solids-not-Fat.	No. of Other Daughters. Not completing 1st Lact. Pd.	Sold at Calving.	Total No. of Daughters.
			lb.	lb.	%	lb.	%			
L.D.	First	6	6018	8206	3·72	224	9·04	1	0	7
„	Second	6	5526	7499	3·87	214	9·11	0	0	6
„	Remainder	5	6849	9208	3·92	268	9·20	0	0	5
„	Total	17	6090	8257	3·83	233	9·11	1	0	18
B.B.	First	6	6873	9342	3·95	271	9·22	3	1	10
„	Second	6	7121	9613	4·00	284	9·31	1	3	10
„	Remainder	2	6737	9095	3·68	248	9·04	0	1	3
„	Total	14	6960	9423	3·93	273	9·23	4	5	23
K.F.	First	6	7158	9786	3·90	279	9·13	4	0	10
„	Second	6	6540	8790	4·01	262	9·00	1	0	7
„	Third	6	5478	7355	3·83	210	8·97	2	0	8
„	Fourth	6	5971	8135	4·06	242	9·07	4	0	10
„	Fifth	6	5713	7839	3·91	223	9·13	2	0	8
„	Remainder	2	6229	8409	4·39	273	8·98	0	0	2
„	Total	32	6175	8383	3·97	245	9·06	13	0	45
I.R.V.	First	6	6237	8606	3·61	225	9·10	1	0	7
„	Remainder	2	6971	9379	3·52	245	8·98	0	0	2
„	Total	8	6420	8900	3·59	230	9·07	1	0	9

In view of the fact that in progeny testing the average production of the *first group* of daughters will be used to give a measure or index of the sire's breeding value, it is of interest to note that for the bull L.D., the average for the first group (6 out of 7) was very close to the average for all the daughters. In the case of the bull B.B., the averages were all quite close together but the increases over the averages of L.D.'s daughters have to be discounted to some extent because in each group the results are for 6 daughters out of a total of 10 which calved within each period. With the bull K.F. there was a considerable difference in the average production of the successive groups, and the first group appreciably exceeded each of the others and also the average for all the daughters; the average for the first group, however, must be qualified and reduced when it is seen to be for 6 daughters out of 10. In the case of the bull I.R.V. the most interesting point is the definitely lower fat percentage in the milk produced by his daughters.

A comparison is also given of the average yield and quality of the milk produced by the first six daughters of each bull and by their dams, and also a comparison of all the dam-daughter pairs of each bull, and it is concluded that the information obtained from the dam-daughter comparisons does not add materially to the knowledge of the bull already gained from the average yields of the first group of unselected daughters.

In conclusion, the writer suggests that Breed Societies might consider the institution of a progeny-testing scheme and the optional publication of such results as were considered worthy of publicity. The attainment of a definite standard or index before publication should not be insisted upon, in view of the variations in conditions of management, climate and other factors, but it is essential that the data submitted for each bull should be reliable and adequate and that, if the average of the first six daughters to complete a lactation period is accepted for publication, the number of other daughters which calved within the same period must also be published. Also, if a Society should decide that the groups of progeny must attain a certain standard in breed type and conformation, inspection could be carried out on the lines adopted by some societies for the inspection of foundation cows.

An interesting and valuable article by Hunter Smith (Ref. 19) gives concise information on the changes and events in a large dairy herd over a period of twenty years where very careful records were kept of calvings, the fate of the calves, heifers and cows, the milk yields, etc. During this period the herd increased from 36 to 70 cows, and it was replenished and increased wholly with home-bred heifers got by pedigree

bulls; the milk yield never fell below 700 gallons and has recently exceeded 1,000 gallons per cow per annum.

During the twenty years (1912–1932) the number of calvings totalled 940 and an analysis month by month shows marked success in regulating the calvings to maintain a uniform output of milk. The figures are :—

October	11·9 per cent.	38·8	April	1·0 per cent.	11·9
November	13·5 ,,		May	2·4 ,,	
December	13·4 ,,		June	8·5 ,,	
January	9·8 ,,	20·5	July	9·7 ,,	28·8
February	6·2 ,,		August	9·0 ,,	
March	4·5 ,,		September	10·1 ,,	

Of the 940 births, 875 or 93 per cent. were singles and the remainder twins, except for one case of triplets. The single births gave almost exactly equal numbers of males (429) and females (426) and in 20 births (presumably abortions) the sex was not recorded. The proportion of single heifers which in due course entered the herd was 68 per cent. of those born, or 34 per cent. of all single calves born. The rate of loss amongst the twins, whether from deaths or from the early sale of heifer calves which were twins to bulls, was much greater. When all calvings are considered 10 calves (male and female) or 5 heifer calves were required to produce three dairy cows. (These results are almost identical with those quoted on p. 105 from the report from the herd of the National Institute for Research in Dairying). During the period covered the herd suffered occasionally from abortion and tuberculosis but was singularly free from scour and other calf ailments. The chief causes of wastage in the breeding and rearing have therefore been abortion (which was responsible for one-third of the losses) and "wasters" or "bad doers". A table giving the incidence of abortion and dead-at-birth shows that 12 per cent. of the singles, and 34 per cent. of the twins were still-born.

The data studied also provide interesting information on the herd-life of the cows. The average composition of the herd during the twenty years was :—1st calvers, 29 per cent.; 2nd calvers, 22½ per cent.; 3rd calvers, 14½ per cent.; 4th calvers, 10 per cent.; 5th calvers, 8 per cent.; 6th calvers, 5½ per cent.; 7th calvers, 4 per cent.; and older cows, 6½ per cent. Thus fully half the herd consisted of first and second calvers but at no time have cows that have had 10 to 13 calves been absent from the herd; indeed, such aged cows have been required in pursuance of the self-supporting policy adopted. The average period of retention in the herd has been 3·2 lactations, and the average age in lactations when drafted out of the herd has been 3·7 per cent. A careful analysis of the records shows that the average time spent in the herd was

3 years and 5 months and that as heifers calved at an average of 3 years, the average age at disposal was 6 years 5 months.

The cows drafted out of the herd have been drawn almost proportionally from each of the age groups, except of course the oldest group. There is no record of cows having been sold because of unsatisfactory milk yields and hence it follows that other causes have been responsible for the removal of all the cows. These other causes, and the proportion attributed to each, are given as follows :—" Wasters " and " bad doers ", 45 per cent. ; barreners and fat, 42 per cent. ; udder, milk fever and calving troubles, 7 per cent. ; lame or accident, 3 per cent. ; and old age, 3 per cent. It is also stated that the incidence of wastage due to " wasting " diseases rose quickly to a maximum at the second lactation and then fell slowly, whereas the incidence of wastage due to sterility and abortion was lowest in early life and increased with age.

It will be noticed that abortion, though at times prevalent in the herd, is not given as a cause of disposal, but there can be no doubt that this disease contributed appreciably to the proportion sold as barreners and perhaps also to the proportion sold as " bad doers ". Thus, in this study, as in others devoted more definitely to the discovery of the chief causes of removal of dairy cows from herds, the summarised results do not give any measure of the prevalence of abortion. This disease is, nevertheless, the cause of very serious losses. The figures given above for the wastage of calves illustrate one aspect of these losses, and Hunter Smith also supplies data on the loss of milk based on a study of 47 lactations following premature births ; he states that the earlier abortion occurs after conception the greater is the resulting loss in milk yield ; that the average loss is 33 per cent., and that even when the calf is carried eight months the loss of milk yield is still as high as 26 per cent. He also states that the records show a total of 63 abortions made up as follows :—Cows aborting once, 25 ; twice, 7 ; thrice, 5 ; four times, 1 ; and 5 times, 1. " Clearly, one abortion in early life gave no security for the future nor was freedom from abortion for a number of years necessarily a guarantee of immunity." This article is well worth careful perusal in full by those interested in the maintenance of dairy herds by home-bred stock.

Some interesting information on the occurrence of twins in a dairy herd is supplied by Hewitt (Ref. 20) from the records kept in the Red Poll and Friesian herd maintained at the State Research Farm, Victoria, Australia. These records cover a period of 24 years for the Red Polls and 15 years for the Friesians. In the former breed there have been 26 twin births out of 1,260, or 2 per cent., and in the latter, 6 twin births

out of 200, or 3 per cent. There were 18 cases in which the twins were male and female. 13 of the twin-with-bull heifers were reared to maturity, but only one proved fertile. Hewitt adds that the free-martins at birth appeared to be normal heifers but that, by examining the udder and teats at the age of 3 or 4 months it could usually be ascertained which would become breeders and which would be barren. Barrenness is indicated by the absence of development of the teats and the lack of "leather" in the udder; as age increases the non-development of the udder and teats becomes more conspicuous and the animal becomes more like a steer in general appearance.

Records of the death-rate amongst the calves born do not show any appreciable greater mortality amongst the twins than amongst the singles, the experience in this respect being markedly different from that commented on by Hunter Smith in the article referred to above. Hewitt also gives details regarding the length of the gestation periods preceding the births of singles and twins. For 470 single male calves born the average gestation period was 285·5 days; for 441 single female calves, 284·6 days and for 25 pairs of twins 276·8 days. The figures indicate that cow calves are carried on the average 1 day less than bull calves, and that twins are carried on the average 8 days less than singles. The data show that twinning in the Red Poll herd has been most prevalent in two families, and it is also stated that the twins and dams of twins have been consistently heavier producers than the other cows in the herd.

The length of gestation periods in Holstein-Friesians and in Jerseys has been studied by Knoop and Hayden (Ref. 21). They found that for 432 gestation periods in Holsteins the average was 278·15 days; for 219 bull calves born the average was 278·5 days and for 213 cow calves it was 277·7 days. For 373 gestations in Jerseys the average period was 278·9 days; for 188 bull calves the average was 279·25 days and for 185 cow calves it was 277·5 days. Taking both breeds together the average for all periods was 278·26 days, but for bull calves it was 278·85 and for cow calves 277·66; bull calves, therefore, were carried on the average 1·19 days longer than cow calves. When the ages of the cows were considered it was found that, for 2-year old cows, the average length of gestation was 276·92 days, and for 6-year old cows, 279·47 days. There is therefore a tendency for the gestation period to increase slightly when bull calves are carried, and also to increase slightly with advancing age. Other studies of this subject quoted give gestation period averages as 278·51 days, 281·40 days and 278·90 days. As these figures are only averages, the writers suggest that for practical management cows should be

considered due to calve, and treated accordingly, 270 days from the date of service.

The number of services required for conception was also studied from the data available and the results were as follows:—Conception from 1st service, 58·8 per cent. in Holsteins and 65·6 per cent. in Jerseys; 2nd service, 21·1 and 24·1 per cent.; 3rd service, 10·3 and 6·1 per cent.; 4th service, 4·2 and 1·7 per cent. and a few others at later services. The averages were 1·87 and 1·53 services per conception. It is suggested that cows which fail to conceive after the third service should be examined by a veterinary surgeon and that if a number of cows mated to the same bull fail to conceive the bull also should be examined.

The importance of maintaining good cows in the dairy herd for the longest possible period is commented on by Petersen (Ref. 22). In Germany some two-thirds of the dairy cows are sacrificed before the age of 6 years but in Denmark research work has shown that the yield, both of milk and of butter fat (total weight of fat) increases up to the seventh calf and diminishes only very slowly to the tenth calf. The ratio between consumption of fodder units and milk production becomes constantly better up to an age of 12½ years. At 3½ years a cow produces only 1·08 lb. milk per food unit; at 7½ years she produces 2·18 lb. milk and at 12½ years, 2·49 lb. milk per food unit. It appears that under Danish conditions a cow becomes profitable to the farmer only after her 6th year. From these facts and a number of others Petersen concludes that, particularly in the present economic conditions, it is of importance to have sound and resistant cows which produce 9 or 10 calves, maintain their full yield for 10 years and reach an age of 14 to 16 years. It is of importance that British dairy farmers should give further thought to the economics of maintaining good healthy cows in their herds for a longer period than is common in many districts.

IV.—Secretion of Milk and Milking.

Hand Stripping after Machine Milking.

Farmers who are considering the installation of a milking machine frequently ask if hand stripping of the cows is essential. The reply given is usually on the lines of the following quotation from the Ministry of Agriculture's bulletin *Modern Milk Production* (Ref. 23). "After the removal of the teat cups it is usually desirable to strip by hand to ensure that all the strippings are withdrawn. It may be found that some cows milk out so completely that hand stripping is unnecessary,

but it will often be found that sufficient milk is left in the udder to warrant stripping by hand."

The opinion given above is based on general experience, and results from experiments on this subject have rarely been available. Recently, however, Wilson and Cannon of the Iowa Agricultural Experiment Station (Ref. 24) have carried out carefully controlled investigations on different aspects of the question. The work was carried out on a group of 25 cows, made up of animals of four different dairy breeds, and the time required to strip by hand, after machine milking, was first ascertained. The milking machine was left on each cow for six minutes, as previous work had shown that this was about the right time for cows yielding up to 6 gallons daily. It was found that the average time required for stripping was 47 seconds, with a range of from 25 to 81 seconds for different cows. The average amount of strippings obtained was 0·6 lb. of milk per milking or 1·2 lb. daily from each cow. Some cows gave as little as 0·1 lb. per milking while the heaviest stripper averaged 1·7 lb. per milking. The fat content of the strippings of individual cows ranged from 2·8 to 13·5 per cent. with an average of 7·5 per cent.

Two groups of cows were then used to measure the effect of non-stripping after machine milking; it was found that during the periods in which stripping was practised, the production of milk and fat was 2·5 per cent. greater than during the periods when stripping was omitted. Some of the milk and fat left at one milking was obtained at the next milking but calculations showed that the omission of stripping resulted in the loss of 54 per cent. of the milk and 27 per cent. of the fat that would have been obtained in the strippings. For each hour of labour spent in stripping, 1·16 lb. butter fat (equal to 1⅓ lb. butter) was secured.

Two methods of manipulation were tried in an effort to reduce the amount of strippings retained in the udder. The first method consisted in thoroughly massaging the udder during the last two of the six minutes allowed for machine milking, and the second in grasping the claw of the machine with the hand and exerting as much downward pressure, during the last minute of milking, as was possible without pulling off the teat cups. Massaging of the udder decreased the amount of strippings by 33 per cent. and the pulling down of the teat cups caused a 55 per cent. reduction. Obviously, the latter method required less of the operator's time.

Wilson and Cannon also remark that certain difficulties encountered indicate that stripping after machine milking is to be recommended as a safety measure. On a few occasions the machines, because of improper attachment, failed to milk

one quarter of the udder, while one cow did not milk uniformly by machine because of a partial obstruction in one teat. There is no doubt that regular hand stripping after machine milking, preferably accompanied by massage, enables the cowman to know the condition of each cow's udder and to lessen the chance that mechanical failures will escape detection. They also suggest that a combination of pulling downward on the teat cups with massage of the udder with the other hand, would prove more effective in reducing the amount of stripping than either method used alone.

V.—Composition of Milk.

Average Fat and Solids-not-Fat Content of Milk.

To every dairy farmer the composition of the milk he produces, with special reference to the fat and solids-not-fat content, is a matter of importance. In ordinary practice this subject does not receive sufficient attention and indeed often receives little thought except when samples are found to contain less than the so-called standard amounts of 3·0 per cent. fat and 8·5 per cent. solids-not-fat.

Statements of the average composition of English milk are to be found in all text books dealing with milk production but many of these are copied from one book to another and are by no means of recent origin. To supply information of a more up-to-date nature Baker and Cranfield have published (Ref. 25) a summary of the data collected at some twelve depôts of United Dairies Ltd. during the years 1923 to 1931. The depôts referred to are situated mainly in the counties of Cheshire, Staffordshire, Derbyshire and Leicestershire and deal with the produce of approximately 1,800 farms and 20,000 cows annually. At each depôt the supplies of milk, as collected from the farms, are received into bulking or balancing tanks, from which samples are drawn at intervals, according to the rate at which the milk passes into the larger store tanks for manufacture or dispatch. The sampling periods may vary from five to sixty minutes according to the quantities of milk passing through the tanks. From the samples thus taken and tested a bulk average figure is calculated and, subsequently, weekly and calendar-monthly averages are compiled. The number of samples collected during the nine-years period was approximately 300,000.

When the averages for each of the nine years were worked out it was found that there was comparatively little variation from year to year, the range in fat content being from 3·58 per cent. in 1925, 1928 and 1929 to 3·66 per cent. in 1931. For solids-not-fat the range was from 8·89 per cent. in 1928

and 1929 to 8·96 per cent. in 1930. The rainfall for each year was also studied and the authors suggest that there is a positive correlation between the yearly average percentage of solids-not-fat and the annual rainfall—years of high total rainfall are also years of higher solids-not-fat content.

The monthly average fat-percentage for the nine-years period is also given and it is shown that November is the month of highest fat-percentage—the average being fully 3·9—and June the lowest with an average of 3·4 per cent. From November to June there is a steady fall in fat content and from June to November there is a steady rise. The monthly changes in the solids-not-fat content are less regular—the highest averages being recorded in June and again in October and November, whereas the lowest averages are found in April and again in August.

Additional information on the fat content of market milk is supplied by Hickson and Thomas (Ref. 26). During recent years over 7,000 samples of milk have been tested for fat content at the advisory laboratories at Aberystwyth and Bangor. The samples were from both evening and morning milk, and the results are given in the following table.

Fat Content.	Evening Samples.		Morning Samples.	
	No.	Per cent.	No.	Per cent.
Under 3·0 per cent.	142	5	744	17
Between 3·0 and 3·49 per cent. .	447	15	1699	39
Between 3·5 and 4·0 per cent. .	1008	34	1240	29
Over 4·0 per cent.	1381	46	666	15
Total .	2978	100	4349	100

It is noted that the majority of the samples were taken from producer-retailers, hence the results give an indication of the fat content of the milk as offered for sale in such cases. The proportion of afternoon samples which contained less than 3·0 per cent. fat is surprisingly high, and some such samples were found in each month of the year. A larger proportion of poor samples would be expected in the morning milk because of the longer interval from the evening to the morning milking, and in the months of May to August inclusive no less than 25 per cent. of the morning samples contained less than 3·0 per cent. fat.

An attempt was made to find out the relationship between size of herd and fat content and it was found that in herds of 8 cows and under, the proportion of samples under 3·0 per cent. was higher than in larger herds. On ten farms where the milk was bottled direct from the cooler, 127 pint bottles of morning

milk were taken at random for analysis ; of these it was found that 26 per cent. contained less than 3·0 per cent. of fat while 12 per cent. contained over 5·0 per cent. These results show a very definite need for bulking the morning's milk, before bottling, if reasonable precautions are to be taken to provide the buyer with milk of average quality.

Variation in Fat Content.

The causes of variation in the fat content of milk continue to receive attention from research workers, but little has been discovered to add to the information already available to British farmers in the publication of the Ministry of Agriculture, entitled "Variations in the Composition of Milk" (Ref. 27). Some investigations carried out by McEwan and Graham in Canada (Ref. 28) emphasise the variation in the percentage of fat which usually occurs from day to day in the milk of cows under good uniform management. The authors give figures showing a considerable variation in the fat content of the milk obtained from the different quarters of the same udder. They add that, in the present stage of our knowledge, we cannot fully account for the very apparent day-to-day variation in fat level and yield.

The effect of different foods on the fat percentage of milk has been studied by Sheehy in Ireland (Ref. 29) and he confirms the belief that, except in rare instances, the fat content of the milk cannot be influenced by the inclusion of specific foods in the ration. He used the following food substances :—Olive oil, linseed oil, cotton seed oil, coconut oil, ground nut oil, palm nut oil, soya bean oil, beef fat, whale oil, palm nut cake, cotton cake, linseed cake, separated- and whole-milk powders, but in no instance was a specific quantitative effect obtained. Cod-liver oil was again shown to depress the percentage of fat when six ounces were given per head daily. With such foods as sugar-beet pulp, mangolds, beetroots, treacle, wet grains, rice meal and green fresh pasture, the fat percentage was not affected when the milk yield was unaltered ; if, however, as a result of the feeding, the milk yield was raised or lowered, the corresponding change in the total output of fat might lag behind that of the milk yield so that, for a short time, the fat percentage might be affected. This is an indirect result of the change in feeding ; it may occur when any change is made and is definitely temporary in nature. Sheehy also points out that the fact that one or more cows may occasionally respond to certain foods by way of increased or decreased milk fat is no proof of a specific quantitative effect of these foods on milk fat ; such a conclusion is warranted only when a group of cows respond in the same way and when the effect is capable of

repetition. He is of the opinion that many of the recorded instances in which changes in the percentage of fat in the milk have been attributed to feeding would not stand criticism. He also claims that, in many cases, the results referred to were due to other causes originating within the cow or in the surroundings.

On several occasions during the last three years it has been claimed that alfalfa meal, when given at the rate of about 2 lb. per head daily, will increase the percentage of fat in milk. Campbell, of the University of Reading, conducted a careful trial with a control group of cows (Ref. 30) and found that the addition of alfalfa meal did not produce any rise either in the milk yield or in the fat percentage, and that the subsequent withdrawal of the alfalfa meal did not result in any sudden decrease in milk yield or fat content. No doubt claims will continue to be made, from time to time, that certain foods will increase the fat content of milk. Little credence should be given to such statements unless supported by definite experimental and scientific evidence.

The effect of feeding cows at different times and different frequencies has been studied by Groh in Czecho-Slovakia (Ref. 31). During the winter one group of five cows was given its daily ration in three equal parts at 5 a.m., 11 a.m. and 5 p.m., and another similar group was given its ration in four equal parts at 5 a.m., 11 a.m., 5 p.m. and 11 p.m. All cows were milked twice daily at 5.30 a.m. and 6.30 p.m. Another experiment was conducted during summer conditions in which the cows were grazing during the morning and afternoon, and a ration of green fodder and concentrates was given in similar proportions at the same hours as above. In a third experiment the daily ration was given in three equal parts (as above) to one group of cows while the other group received one quarter in the morning, one quarter at mid-day and one half in the evening. The results of all three experiments showed that the times and frequency of feeding had no appreciable effect on the yield of milk or on the fat or solids-not-fat content of the milk.

Variation in Solids-not-Fat Content.

On numerous occasions in recent years attention has been drawn to an apparent increase in the instances of milk containing less than the "standard" amount of solids-not-fat, namely, 8·5 per cent.; the lack of accurate knowledge on the variation in the amount of solids-not-fat in milk, and on the contributing causes, has been more fully realised.

Bartlett (Ref. 32) has studied the solids-not-fat records collected in the herd of the National Institute for Research

in Dairying, during the last ten years, comprising about 300 complete lactation periods and about 10,000 samples. He has also carried out several experiments. His report contains some definite contributions to our knowledge of this subject. The solids-not-fat content of the first-drawn milk (fore-milk) and last-drawn milk (strippings) was examined and it was found that the proportion of solids-not-fat remains comparatively constant throughout the milking process. In this respect the case is very different from that of the fat content, which increases appreciably towards the end of each milking. (To avoid confusion owing to changes in the fat percentage influencing the percentage of solids-not-fat in the milk, Bartlett worked out the solids-not-fat figures as percentages of "fat-free milk"). The percentage of solids-not-fat found after long and short intervals between milkings was next studied, and it was found that again, in marked contrast to that of fat, the solids-not-fat content was almost identical in the fat-free morning and evening samples. Ordinary analysis, because of the higher fat content of the evening milk, will generally show that the solids-not-fat percentage in the latter is very slightly less than in the morning milk from the same herd. Bartlett also studied the effect of advancing lactation and found that the solids-not-fat percentage is high immediately after calving but falls rapidly and attains a fairly constant level thirty to forty days after calving; this level is maintained for most of the lactation period and rises again gradually during the last three months. In this respect the lactation curve for solids-not-fat is similar to that for the fat percentage. The effect of age was also investigated; it was found that the milk of heifers contained, on the average, a slightly higher percentage of solids-not-fat than the milk of older cows, and also showed a greater increase towards the end of the lactation. When a comparison was made between pregnant and barren cows it was discovered that in second calvers and older cows, not in calf, the percentage of solids-not-fat decreased towards the end of the lactation. Bartlett points out that pregnancy after five months appears to influence the solids-not-fat content favourably, and that in herds where sterility is common there is likely to be more difficulty in maintaining a satisfactory percentage.

Other work at the National Institute for Research in Dairying carried out by Peskett and Folley (Ref. 33) indicates that the presence of a constituent of the blood (blood serum albumin) in the milk is occasionally associated with low solids-not-fat content, and these workers suggest that a low solids-not-fat content may be due in some cases to a diseased condition

of the udder; in other words, mastitis may play a part in causing the production of milk low in solids-not-fat.

Purchase of Milk on a Composition Basis.

The problem of paying for milk by a method which will take into account the varying amounts of fat and solids-not-fat in different consignments has been studied by Cranfield and Blood of the Midland Agricultural College (Ref. 34). The authors comment on the facts that purchasers of milk for manufacturing purposes have for many years realised that the composition of the milk should be taken into account in fixing the price to be paid but that, where milk is purchased for sale for liquid consumption, payment according to composition has received scant attention. They give a useful summary of the different systems which have been tried in different countries and describe a system which they believe could be put into operation and which takes account of the weight of milk, fat and solids-not-fat delivered by individual producers month by month. An illustration is given of how the system would work, based on the supplies received by a depôt from 36 farms, and the article affords useful information on an important but complex subject.

It is probably true that the sale of milk through the Milk Board does not at the moment encourage buyers to give a trial to new methods which take account of the fat and solids-not-fat content of the milk as well as of the total quantity. But it may well be that as the centralised methods adopted by the Board are improved, and perhaps made more elastic, to suit local conditions, the introduction of some such system may be rendered easier and more workable and may be rapidly brought into practical use.

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THE FEEDING OF LIVESTOCK.

The establishment, during the past year, of marketing schemes for pigs and milk has given a marked stimulus to the demand from farmers for guidance as to how their live stock may be fed to best advantage in respect both of economy of production and quality of product. Organised control of marketing postulates efficiency of production and the supply of an article of reasonably good and uniform quality. Towards the attainment of these ends no other factor operating upon the animal is so potent as the nature of the food supply and the manner of its use.

The volume of information at the disposal of the adviser on farm feeding grows apace and thereby, rather paradoxically, adds to the difficulty of his task; the more the mysteries of nutrition are unravelled the clearer becomes the evidence of their complexity, and of the impossibility of reducing to simple rules and formulae the knowledge essential to the practical business of feeding. In words used five years ago in the introduction to the Report for 1928, "no longer is it possible to define the nutritive requirements of our live stock simply in terms of the *quantities* of *proteins*, *oils* and *carbohydrates* supplied in the ration, but we must also take note of the *quality* of these basic ingredients, of the nature and amount of the

mineral ingredients and *vitamins* by which they are accompanied, and of the environmental conditions as to *temperature*, exposure to *light*, etc., under which the ration is to be consumed. Nor will a correct adjustment of all these factors ensure complete success unless it is accompanied by the degree of *efficiency of management* of the animal that is essential to maintain it in the state of bodily health and 'fitness' necessary for the full exploitation of the possibilities of the food".

The position outlined in these words develops steadily year by year, making the business of feeding more rather than less complex with each advance of science. On the other hand this added complexity means that we can adjust practice more closely and rapidly to the varying conditions of live stock, food supplies, housing, etc., than our less adequate knowledge of a few years ago would permit.

I.—The Technique of Practical Feeding Experiments.

Advance in our knowledge of animal nutrition is naturally dependent upon the framing of reliable methods of investigation, which must range from the intricate and delicate technique required for the laboratory investigation of "fundamental" problems to the necessarily cruder forms of the "practical" feeding experiment. This latter type of experiment, in which two or more groups of animals are put on different rations, and the results gauged in terms of live-weight increase, milk yield, etc., has always figured largely in nutrition literature, owing to the comparative ease with which it can be carried out with simple resources, and the close resemblance of the conditions to those under which farm feeding is carried out.

Although the great possibilities of variation in the response of different individual animals to identical treatment is commonplace knowledge on the farm it has been all too frequently ignored in the planning of practical feeding experiments, with the result that the amount of reliable information derived therefrom has been very small in relation to the great number of tests made. More than twenty years ago the late Professor T. B. Wood and others demonstrated that the group method of experiment is useless for the measurement of differences of 10 per cent. or less between the rations compared unless large numbers of animals are included. It is just as useless to attempt to measure a 5 per cent. difference in nutritive value between two rations with groups of five or six animals in each as it would be to try to grade eggs to the nearest dram with scales that are only accurate to an ounce. Even with 10 or 15 animals in each group, matched as closely as possible as to breeding, age, weight,

sex, etc., individual variations usually make it impossible to detect with reasonable certainty differences of less than 10 to 15 per cent. in the efficiency of the rations compared. This is well illustrated by the appended data from one of the Harper Adams College pig-feeding tests (Ref. 1) in which five lots of 10 pigs each were subjected to identical feeding and management.

	Initial Live-weights. Per head. Range of Variation.		Av.	Live-weight Increases in 138 days. Per head. Range of Variation.		Av.
	lb.	lb.	lb.	lb.	lb.	lb.
Lot I	34·5 to	52·7	43·8	104·2 to	224·0	159·0
Lot II	36·7 „	58·7	44·6	124·7 „	193·0	159·0
Lot III	38·5 „	53·7	45·2	102·2 „	218·2	156·9
Lot IV	32·5 „	61·0	43·7	95·7 „	212·7	160·2
Lot V	33·5 „	60·5	43·7	102·2 „	249·2	165·8

The average live-weight gains of the Lots show an extreme difference of 8·9 lb. or 5½ per cent. of the average live-weight increase of the fifty pigs. Clearly if a larger number of Lots had been similarly compared an even greater range of difference in the averages would have been found. The statistician would tell us indeed that with the range of variability shown above it would not be safe, in a similar test in which each Lot was on a different ration, to assume that differences in the average live-weight gains amounting to less than 10 or 15 per cent. of the average gain for all the Lots were due to the different rations used.

With the small margins on which profit in live-stock husbandry turns to-day it is clearly desirable that a more accurate method of experiment should be devised. Whether this can ever be obtained along the lines of group feeding seems increasingly doubtful, the evidence pointing more and more clearly towards the adoption of methods based upon the individual rationing of each animal included in the experiment. It is not possible here to describe some of the recent developments along these lines, but the reader will find these ably reviewed by Dunlop (Ref. 2) in a recent publication based upon work at Cambridge.

II.—The Assessment of Nutritive Values.

In previous reports we have repeatedly stressed the evidence that the nutritive effect of individual foodstuffs or of mixtures may vary considerably according to the circumstances in which they are used. The value of a foodstuff may vary, for example, according to the amount of it that is fed, or according to the

nature and quantity of the other ingredients of the ration in which it is embodied. No single figure, therefore, be it starch equivalent, net energy or food unit, can adequately express the nutritive value of the foodstuff under all conditions, and for our advisory practice we can only select as a basis the value that applies to average conditions, making rough adjustments up or down where the conditions of use are likely to give rise to a nutritive effect above or below the average. We may assume, for example, that when used in moderate quantities in fully efficient rations mangolds may have an average production starch equivalent of 6 per cent., falling to 5 per cent. or less when large amounts are fed or rising to 7 per cent. or more if only very small allowances are in question.

Seeing then that individual foodstuffs cannot be evaluated apart from the rations in which they are used, there would seem to be grounds for the contention of Forbes, of the Pennsylvania Institute of Animal Nutrition, that we should abandon the practice of attaching definite values to individual feeding stuffs and confine ourselves to a statement of the value of the ration as a whole. The principle underlying these ideas has been formulated by him as " The Law of Maximum Normal Nutritive Value " in the following terms (Ref. 3): " An individual foodstuff expresses its normal and most characteristic nutritive value, for a given kind of animal under specified conditions governing nutritive requirement, only as it is a part of a ration which is qualitatively complete and quantitatively sufficient, for the conditions existing—except as it may express the same value by virtue of the capacity of the animal temporarily to protect itself from food nutrient deficiency, by drafts upon the nutritive reserves of its own body, or as it may express even higher apparent value, under certain pathological conditions, or during undernutrition, by virtue of the protective or body-sparing capacities of nutrients ".

The statement is perhaps involved, but what it amounts to is that the individual foodstuff can only exercise its true (normal) value when the ration containing it either fully meets all the requirements of the animal or presents only such deficiencies as the animal can, for a time at any rate, make good out of the nutritive reserves of its own body.

The final clause of the " Law " as stated above, takes account of the fact that a foodstuff may exercise a greater effect when added to a markedly deficient ration than when added to a more nearly perfect one, but it is illogical to credit the whole of this improvement to the added foodstuff since, through the reduction of the deficiency effected by its addition, the other foodstuffs present in the ration will now also be acting more effectively. Take, for example, the well-known improvement

in the growth-rate of pigs that is effected when milk is added to a ration of barley meal and sharps. This improvement, though *effected* by the addition of the milk, is not *due* entirely to the milk, since the pig is now getting the full value out of the barley and sharps that it could not obtain (owing to deficiencies of protein, minerals, vitamins, etc.) when these meals were fed alone ; the improvement is thus to be credited to the whole combination of barley, sharps and milk.

If the principles embodied in Forbes' " Law " are accepted then it is clear that experiments can only be decisive when the rations are planned so as to be complete, perfect and sufficient in all characteristics except the single one upon which evidence is sought. Before this ideal can be reached, however, we need further detailed knowledge as to the bearing of specific nutritive deficiencies upon the utilisation of food, and as to the extent and duration of the protection of the animal from nutrient deficiencies that may be afforded by drafts upon its own nutritive reserves.

III.—Diet and Health.

Of the many factors that may effect the efficiency of rations the maintenance of the animal in normal health is clearly one of the most important, and may perhaps be regarded as the supreme test of efficiency in the practical management of live stock. Of the numerous forms that ill-health may take we can concern ourselves here only with such as are traceable wholly or in part to nutritive irregularities or deficiencies. The subject was dealt with at some length in this Report two years ago, and only a brief reference can be made here to a few items from the large volume of literature subsequently published.

It is now common knowledge that certain forms of anæmia that cause trouble in the rearing of live stock are associated with nutritional deficiencies, and, therefore, a recent review by Davidson and Leitch (Ref. 4) of the present state of knowledge of the subject has a definite practical interest. This review covers the incidence of nutritional anæmias on both man and animals but we need only touch here upon some of the more interesting matter relating to the trouble in farm animals.

The most familiar form is the anæmia that so frequently develops in sucking pigs at 3–4 weeks old when confined to sties, especially during the winter months. Such pigs become dull and listless, develop very white skins and hairy coats and the general appearance becomes stocky and thick-set. Breathing may become difficult and sudden death is not uncommon. Examination of the blood shows a low content of hæmoglobin and the trouble is directly traceable to deficiency of iron in the

sow's milk. Research has shown that the hæmoglobin content of the blood of the healthy young pig falls from birth for about ten days, but then tends to rise somewhat if the supply of iron to the pigling is adequate ; if on the other hand the supply is inadequate the hæmoglobin content falls further and anæmia sets in. Unfortunately the addition of iron salts to the sow's diet does not raise the iron content of her milk and, therefore, remedial treatment must be applied direct to the young pigs. Any conditions which permit early access of the pigs to supplies of iron, *e.g.*, farrowing out of doors, a supply of soil in the pens, or the direct supply of iron either by direct dosing, or painting on the sow's udder or mixing with food or gravel in shallow pans into which the little pigs can climb, will help to ward off the anæmia. Such preventative treatment should be instituted from birth in the case of piglets kept in close confinement, but need not be continued after they have commenced taking meal food freely, although it may still be desirable to add 0·1 per cent. of iron persulphate to the meal food. Where direct administration of iron salts is practised there seems to be some increase of efficiency if a little copper salt is also added, a suitable daily dose being 5 milligrams of copper along with 25 mg. of iron.

The subject has received considerable attention at the Illinois Experiment Station from which interesting data on the incidence of the trouble and the efficiency of the preventative treatment have been reported (Ref. 5). Of 55 pigs farrowed during February and March and confined either indoors or outdoors on board and concrete floors without treatment, 96 per cent. became anæmic and 40 per cent. of the anæmic pigs died. Of 38 pigs farrowed during the same months and confined indoors, but given treatment, not one became anæmic. The treatment in this case consisted in brushing the udders of the sows one or more times daily from farrowing until weaning time with a solution containing iron and copper made by dissolving 19·6 gms. of crystallised copper sulphate and 89·5 gms. anhydrous iron persulphate in 500 cc. of water (or roughly ¾ oz. and 3¼ oz. respectively in 1 pint) ; an equal volume of maize syrup being added to make the solution sticky and more palatable. The treatment has no subsequent ill-effects.

Where piglets have access to grass or soil runs from the earliest age this nutritional anæmia does not often appear, nor does it in the case of lambs and foals which are commonly reared outdoors. The chance of its occurrence in calf-rearing would seem to arise in many cases, but no definite observations seem as yet to be available.

In some parts of the world certain other ailments of live stock have now been shown to be anæmic in character. The "bush sickness" with which cattle are affected in some parts of

New Zealand, the closely similar trouble of nakuruitis in cattle met with in Kenya, as also the condition of " pining " occurring in sheep and cattle on certain hill and island pastures in Scotland all seem to be more or less closely associated with iron deficiency.

The case of the New Zealand " bush sickness " is particularly interesting. Horses apparently are in no way liable to it, grown cattle also will thrive for 9 to 12 months and may be fattened on bush-sick pastures. whilst sheep thrive for only 6 to 9 months. On the worst pastures no young ruminants can be reared beyond the stage of weaning ; whilst on the better areas calves can be reared but not lambs. These observations suggest a relationship between the capacity of young stock to derive sufficient iron from these pastures and their rate of growth. The relatively slowly growing foal finds enough anywhere ; the calf only on the better pastures, whilst the quickly growing lamb fails on even the best of these areas.

An anæmia of stock that appears superficially to be identical with bush sickness is met with on the coastal plains of Florida, where it is known as " salt sickness," and in parts of Eastern Holland, under the name of " Lecksucht ", which affects cattle, goats and sheep. In these cases the results of investigation point to deficiency of copper in the soils as the causal factor.

Another type of deficiency disease which has received widespread attention in recent years is that which is associated with conjoint or separate deficiency of vitamin D and calcium, and is commonly referred to as rickets. Its incidence upon human beings and animals in the growing stage is well known, but less so in the adult, except in countries like China and India where diets are apt to be very simple and correspondingly liable to deficiencies. A review of information on this adult form of the disease or " Osteomalacia " has recently appeared in *Nutrition Abstracts and Reviews* (Ref. 6), and includes a brief section on osteomalacia in domestic animals. This trouble would appear to be rare on our own farms, but has been met with in other parts of the world, including Ceylon, the Phillippines, China, and possibly New Zealand. The cases so far noted seem to be confined to sheep, goats and horses. It has not as yet been found in cattle. The cause would seem to lie mainly in an unfavourable ratio of calcium to phosphorus in the food, as in the case of rickets in younger animals.

On the last-named point a further report from the Ohio Agricultural Experiment Station (Ref. 7) confirms the findings of earlier work as to the importance of the calcium-phosphorus ratio in the diet of the growing pig. In general the best results were obtained with a ratio between 1 Ca : 1 P and 2 Ca : 1 P. When the ratio exceeded 3 : 1 rachitic symptoms appeared and the requirements for vitamin D were increased. The absolute

amounts of calcium and phosphorus present also exerted an effect apart from the ratio. In most rations deficiency of calcium is more to be feared than shortage of phosphorus, but the latter must not be overlooked. In the Ohio experiments evidence was obtained that the phosphorus content of the ration should not, in the absence of added vitamin D, be less than approximately 0·60 per cent. for good growth and bone formation. The requirements for this vitamin can be minimised by properly adjusting the calcium and phosphorus content of the ration.

Further studies on the problem of calcium deficiency in sheep have been reported from the Rowett Institute (Ref. 8). Supplements of chalk or codliver oil fed to sheep on a calcium-deficient ration resulted in improved growth rate and health, a combined supplement of the two being more effective than either alone. The arrest of growth in sheep on the deficient ration was due partly to less food being eaten and partly to less efficient utilisation of what was consumed. The proportion of calcium in the blood-serum was raised by the additions of chalk or codliver oil, the latter being the more effective in this respect. The effect of the oil in this particular, however, was much greater than its effect in increasing body growth or the retention of calcium in the body.

The lowered efficiency of utilisation of food in mineral-deficient rations has also been recorded in studies of phosphorus-deficient rations fed to dairy cows at the Kansas Experiment Station (Ref. 9).

IV.—Protein Supply Problems.

Supplementary Relations of Proteins.

In the last two Reports (1931, p. 80; 1932, p. 123[1]) the subject of the bearing of the chemical make-up of proteins upon their efficiency in nutrition has been discussed at some length, and it will suffice to recall here that all proteins are complexes of simpler ingredients (mainly amino-acids and amides) into which they are resolved by the action of the digestive agents. It is this mixture of amino-acids and amides that enters the blood-stream and the total of their activities within the body constitutes the nutritive effect of the food-protein. Just as the possibilities of building are determined by the variety of materials at our disposal and the nature and amount of each, so also the extent to which a protein can meet the needs of the animal will be determined by the kind and amount of amino-acids and amides to which it gives rise when broken down (digested) in the digestive organs. The importance of the individual amino-acids

[1] *R.A.S.E. Journal*, Vol. 94, p. 283.

varies, some of them (*e.g.*, lysine, cystine, histidine, tryptophane) being apparently quite indispensable, whilst the absence or deficiency of others seems to be less serious. Clearly, therefore, a ration, to be perfect as to protein quality, must supply from its proteins in the process of digestion all the *essential* amino-acids in suitable amounts. If any one be absent or deficient in amount it will form a limiting factor determining the efficiency of the whole protein supply, and, for want of the missing " cog-wheel " the " machine " will either not function at all or at best will not run as smoothly as it ought. If now, to a ration thus deficient, a foodstuff is added whose proteins are also similarly deficient with regard to this particular amino-acid no increase of protein efficiency will be secured, whereas the alternative addition of some other foodstuff whose proteins do supply the missing " cogwheel " will effect a marked improvement in the running of the " machine ", and the whole mass of protein digested can now be made fully effective. The individual proteins, or the mixtures of proteins present in individual foodstuffs, may thus not only differ appreciably in their value to the animal, but this value may also vary according to the nature and amount of other proteins fed along with them. Where, then, as is almost invariably the practice in farm feeding, rations consist of mixtures of foodstuffs, the protein supply must be considered as a whole, and it is hardly possible to apportion credit (or blame) for the final result between the individual proteins present.

The position with regard to the specific problem of protein effects is thus precisely similar to that discussed above in Section II with reference to the assessment of the general nutritive effect of foodstuffs and rations.

The experimental study of the relative dietary values (or " biological values ") of proteins consists usually in determining the proportion of the digested protein that is effectively utilised by the animal by storage in the body or in the form of products such as milk, eggs, wool, etc. If the experimental diet contains only one protein, as may be possible with some classes of animals under laboratory conditions, the biological value of the protein as a supplement to the reserve proteins of the body may be directly measured, but if, as is usually the case in work with farm animals, the protein in question must be added to a basal diet containing other proteins, the result obtained is the *supplemental* value of the protein in relation to that particular basal diet, and will not necessarily hold good for other basal diets. Statements as to the biological value of proteins can, therefore, have little significance unless we are informed as to the nature of the diet in which they have shown this value. Provided, however, this information is supplied, and is kept in mind such data on

the protein supplemental values of different foodstuffs when added to a range of basal diets can have very considerable practical interest and value. It is indeed information of this character that we need for our rationing work in order to enable us to ensure that our ration supplies not only a sufficient *quantity* of proteins, but that these proteins together shall yield on digestion all the requisite amino-acids, etc., in suitable proportions, or, roughly expressed, the proteins shall be perfect in " quality ".

The interest of the subject is reflected in the numerous recent publications dealing with it, on some of which we may briefly comment.

In work at the Hannah Dairy Research Institute (Ref. 10) Morris and Wright, working with milch cows, have compared the proteins of beans, linseed and meat meal when added to a basal ration of straw, beet pulp and oats. Compared with the proteins of beans the proteins of linseed are relatively poor in lysine, whilst those of meat meal are seriously deficient in tryptophane, whilst on the other hand the proportions of both these essential amino-acids are relatively high in milk proteins. It was to be expected therefore that the milk yields would be lower on the linseed and meat meal rations than on the bean meal rations and such was found to be the case. There was evidence, however, that the cow could to some extent make good the deficiencies by drawing upon reserve protein in her body. Protein wastage (as shown by the amount of nitrogen in the urine) was low during bean meal feeding, high with linseed, and intermediate with the meat meal supplement. Under the conditions of these experiments the biological values for milk production of the mixed rations containing bean meal, meat meal and linseed meal were 59, 55 and 46 respectively.

In a later report (Ref. 11) the same workers give the results of similar experiments in which the supplementary foodstuffs were blood meal, pea meal, decorticated groundnut cake and flaked maize. The lysine content of blood meal and pea meal is relatively high, whilst that of the other two foods is relatively low. The effect upon the milk yield again accorded with the expectations based upon these facts. The biological values of the protein of the rations under the conditions of the experiment worked out at 73 for the blood meal ration, 64 for the pea meal ration, 50 for the groundnut ration, and 52 for a ration in which both groundnut cake and flaked maize were used. From these experiments it seems clear that there is a close correlation between the biological value of a ration for milk production and its content of lysine and tryptophane.

The relatively high biological value of pea and bean proteins (due to comparative richness in lysine) has also been confirmed

in Russian experiments (Ref. 12) and in Polish experiments (Ref. 13). In the latter case, working with rats, taking the biological value of the proteins of wheat bread as 1, the value for rye bread was 1·1, and for peas 1·21–1·38. The value rose further to 1·6–1·9 with mixtures of 80 per cent. wheat and 20 per cent. peas (or 60 per cent. rye and 40 per cent. peas), and to 2·0 for mixtures of 60 per cent. wheat and 40 per cent. peas. The relatively high improvement shown by the mixtures finds an explanation in the fact that, apart from the effect of the peas in making good the deficiency in lysine of the cereal proteins, the cereals on their part would make good the rather low cystine content of the pea proteins.

In experiments at the Lister Institute (Ref. 14) the relative nutritive values of the proteins of wheat and maize for the growth of young rats has been determined. Taking as the criterion the gain in weight per gram of protein ingested, little difference was found between the proteins of whole wheat, yellow maize and white maize, the values found being 1·36, 1·29 and 1·30 respectively. After cooking, the cereal diets were eaten more readily and the nutritive value of their proteins appeared to be slightly greater (1·51 and 1·38 for wheat and yellow maize respectively).

If the ratio were calculated on the basis of protein used over and above maintenance requirement, the figure for the raw wheat became 1·85 and for raw maize 1·73, whilst the apparent difference between the cooked and raw cereals disappeared. The nutritive value of the protein of "maize gluten" was found to be inferior to that of the proteins of the whole grain, doubtless owing to the greater concentration in it of the particular protein zein, which is deficient in tryptophane.

As a further example of results from studies of the biological values of proteins some French experiments with growing pigs may be quoted (Ref. 15). In all cases the foods dealt with were compared experimentally with skim milk, and gave the following average results for the percentage efficiency of the proteins as compared with those of skim milk taken as 100 :—

Casein . .	78·6	Oat Flour . .	53·6	Soya Flour . .	66·5
Beef Muscle . .	74·3	Gram Flour . .	49·6	Pea Flour . .	53·2
Egg White . .	70·8	Maize Flour . .	45·0	Groundnut Flour .	49·0
Barley Flour .	64·7	Wheat Flour .	37·8	Lentil Flour .	36·8
Rye Flour . .	54·0	Whole Oat Flour	32·5	Bean Flour . .	34·4

The low results for peas and beans are surprising and suggest that deficiency factors other than those associated with the proteins must have been operative in these tests.

Special interest attaches to the question of the biological value of the proteins of forage plants, on which some data are

available from experiments at the New York (Cornell) Agricultural Experiment Station (Ref. 16). In these experiments the biological values of the proteins of lucerne hay and of clover hay, and of mixtures of these hays with maize, were determined. The average of the biological values for growth and maintenance was 81 for clover protein, 79 for lucerne protein, 80 for the combination of clover and maize, and 77 for the combination of lucerne and maize. These results suggest a relatively high level of "quality" for these fodder proteins.

In the different series of experiments outlined above a variety of animals was used, and the question may well be raised whether the biological values of proteins are the same for all animal species. Little evidence is available on this point, but in recent French experiments (Ref. 17) with rats, rabbits and pigs, using milk proteins, beef proteins, pea proteins, and casein, great variations were found both as between the individual species and the proteins, so that the conclusion is drawn that the biological value of a protein or a mixture of proteins is not the same for different species of animals.

Protein Utilisation and Requirements.

Few years pass without further contributions to the subject of the protein requirements of animals, especially dairy cows and pigs. The tendency of recent years has been to arrive at lower standards for the cow than were indicated by the older investigations. This is illustrated by the Ohio investigations, which were briefly noted in last year's Report (p. 126). Commenting further upon the results in the Annual Report of the Ohio Station (Ref. 18), it is suggested that a standard of 1·25 lb. of digestible crude protein in the food for each pound of protein contained in the milk will be sufficient, along with the customary maintenance allowance, to maintain the cow in good condition and provide a reasonable milk flow, whilst at the same time furnishing a sufficient margin of safety to protect the cow from disaster due to protein deficiency. This represents a reduction of nearly 30 per cent. from the standard (0·6 lb. per gall. of milk) commonly used in this country; or put in another form, where we commonly advise that the "balanced" milk food, of which 3½ lb. should be allowed per gall. of milk, should contain 17 per cent. of digestible "protein equivalent" the Ohio standard would be satisfied if the food contained 12 per cent. of digestible protein equivalent. The Ohio data suggest, however, that this level of protein feeding would only suffice for the needs of the 600–700-gall. cow and that there is some advantage from the use of additional protein, especially in the case of high-yielding cows, but this advantage may easily be bought too dearly.

The desirability of taking the level of milk yield and intensity of feeding into account in fixing the basis of calculation of protein requirements is also indicated by the results of recent German experiments (Ref. 19), based upon the food consumption and yield of 141 recorded cows. The yield during the stall-feeding period from calving until going out to pasture (average, 90–100 days) was taken for the purposes of comparison, the actual yields being corrected for varying fat content by converting into the equivalent amounts of milk containing 4 per cent. fat. During ordinary feeding, with an average daily food consumption of 9·07 kg. (20 lb.) starch equivalent and a yield of 25·4 kg. (55·9 lb.) of 4 per cent. milk, 0·0575 lb. digestible protein and 0·272 lb. starch equivalent were required per 1 lb. milk produced. During special herd-book tests in which heavier feeding was practised, 12·4 kg. (27·3 lb.) starch equivalent was consumed daily with an average milk yield (4 per cent. fat) of 29·4 kg. (64·7 lb.), so that for 1 lb. of 4 per cent. milk, 0·0805 lb. of digestible protein and 0·326 lb. of starch equivalent were used. Thus at the higher level of feeding 40 per cent. more digestible protein and 20 per cent. more starch equivalent were used, per pound of milk produced, than at the lower level of feeding. In general throughout these tests the food (and protein) consumption per pound of milk increased with increasing yield.

The extensive series of studies of growth and development carried out by Brody and his colleagues at the Missouri Experiment Station, to which frequent references have been made in these Reports, have also now been extended to cover milk secretion (Ref. 20). Evidence has been obtained that although the maintenance energy requirements of cows at different ages increase with increasing live-weight, the maintenance protein requirements may remain roughly constant. If this is so, it is possible that dairy cattle fed according to "good dairy practice" may be receiving a considerable excess of protein in their diet. In cases quoted of animals so fed the intake of digestible crude protein varied from 0·14 to 0·47 lb. per 100 lb. live-weight, whilst total intake of digestible nutrients ranged from 1 lb. to 2 lb. per 100 lb. live-weight. Incidentally it is also suggested from the Missouri data that young calves (3–9 months) are commonly overfed with respect to protein and relatively underfed with respect to energy; that the protein content of the meal (or grain) mixture should be reduced, and an inexpensive oil added to the skimmed milk fed to calves in order to compensate for the removal of the butter-fat.

On the protein and general nutritive requirements of pigs several new reports are available. From a three-years' control test of food requirements for breeding sows, carried out in

Norway (Ref. 21), the conclusions drawn as to protein requirements are that during gestation the sow should receive 200–250 gms. (about ½ lb.) of digestible protein per day (in 4½–5 lb. food), and that during suckling additional food should be given at the rate of 1·1–1·3 lb. for each pig suckled, such added food supplying 120–130 gms. (4¼–4½ oz.) of digestible protein per food unit (or roughly one-half these amounts per lb.).

In a report from Wye (Ref. 22) a higher level of protein feeding is recommended; an average protein intake during gestation of about ¾ lb. (presumably total, not digestible only) per day is suggested, increasing to about 1¼ lb. per day during the last 2–3 weeks; whilst during the suckling period it is suggested that the ration should contain 16–17 per cent. digestible protein. In the light of data obtained elsewhere one may doubt whether such high levels of protein supply are either necessary or desirable.

In a German report (Ref. 23) in which the results of feeding 138 groups of pigs on rations containing different amounts of protein were analysed the conclusion was reached that the previously accepted average standard of 300 gms. (0·66 lb.) per day was unnecessarily high, and that more economical results were obtained by working to the following scale:—

Weight of Pig. Kg.	Amount of Digestible Protein. Gms.
30–50 (66–110 lb.)	215 (0·47 lb.)
50–70 (110–154 lb.)	265 (0·58 lb.)
70–100 (154–220 lb.)	280 (0·62 lb.)

This gives an average requirement of 263 gms. per day over the whole feeding period. Smaller quantities of protein resulted in slower growth and a reduction in the proportion of lean to fat in the carcase.

For heavier pigs, from 100–150 kg. (198–330 lb.) live-weight, where fat production is desired, the protein supply may be gradually lowered. The following are taken from Swedish experiments (Ref. 24):—

Live Weight. Kg.	Digestible Protein per day. Gms.
85–115 (187–253 lb.)	224
115–135 (253–297 lb.)	196
135–155 (297–341 lb.)	185

Lastly reference may be made to recent work in Northern Ireland on the feeding of laying hens (Ref. 25) which again suggests that for this class of live stock also our existing protein

standards are too high. It is universally advised that the cereal foods which form the basis of all poultry rations should be supplemented by foods rich in proteins (fish meal, soya meal, etc.) in order to avoid protein deficiency, especially where production is fairly high. It comes as a distinct shock, therefore, to find that in the Irish experiments a laying mash of cereals supplemented with 0·5 per cent. of salt was capable of supporting egg production at a level of more than 200 eggs per bird per annum. By comparison with the results obtained with birds receiving a similar ration supplemented with various amounts of extracted soya bean meal the cereal-salt ration did not depress either the winter egg production in the second year, the size of the eggs or the size and health of the birds.

In view of the general costliness of "protein supplement" foods the point at issue in these experiments has clearly an important economic significance, and it is highly desirable therefore that confirmation should be obtained through repeated tests with different breeds and under a variety of conditions before any drastic change in existing practice is advocated.

Protein and Wool Growth.

This subject was touched upon briefly in last year's *Guide* (p. 124[1]), but a fuller survey is now available in Dr. Fraser's review published in *Nutrition Abstracts and Reviews* (Ref. 26). The opening paragraph of this review defines the possibilities of influencing wool growth with admirable clarity. "The maximum quantity and the optimum quality of wool grown by a sheep are determined by its genetic constitution. Maximum weight, length, and density of fleece are inherited characters, and the importance of nutrition lies in the provision of concrete materials for the full expression of genetic potentialities. It follows that nutritional experimentation can only affect wool growth by producing a dietary deficiency or by remedying one already existent. It is clear that a surplus of food or of any food constituent will not be recovered in a surplus of wool. If the addition of any substance to a basal ration leads to a measurable increase in wool growth it is evident that the basal ration is deficient in that particular substance, and that similar results will be obtained only with a basal ration of the same degree of deficiency. The extent to which wool may be influenced by nutrition is, therefore, strictly limited in the sense that it can allow the realisation of a genetic optimum but can never surpass it. Any revolutionary changes in wool production must be sought for in the provinces of genetics and endocrinology."

[1] *R.A.S.E. Journal*, Vol. 94, p. 284. M 4

The principle enunciated above with specific reference to wool production has probably a general application to most other forms of production (*e.g.*, milk, eggs, etc.) and is all too frequently overlooked.

Pure wool fibre, freed from the grease and other constituents of the natural fleece, is a protein substance, keratin, which is characterised by containing amongst its constituent amino-acids a peculiarly high proportion of cystine—a sulphur-containing amino-acid essential for growth. Thus whereas vegetable and other animal proteins contain only from 1–3 per cent. or less of cystine, keratin contains about 13 per cent. It is not surprising, therefore, that a large part of recent nutritional research on wool has been concerned with cystine problems.

The question whether the sheep must have its total supply of cystine pre-formed in its food, or can manufacture it in its body out of other materials, cannot yet be answered with certainty. Laboratory experiments with other animals (rats, mice and dogs) have shown that in their case the cystine requirements must be fully covered by the supply of cystine in their dietary, and that cystine cannot be replaced by sulphur in other forms. This, however, does not exclude the possibility that the sheep, with its remarkable capacity for wool growth, may differ from other animals in being equipped with a special mechanism for the solution of its chemical difficulties of wool production. Field experimental work in which the amount of cystine contained in the fleece has been compared with the amount supplied by the pasture herbage seems to point to the possession by the sheep of powers of synthesis of cystine in its body, but the data for the cystine content of pasture and other foods are as yet not sufficiently reliable to permit of a crucial test along these lines. Were cystine deficiency in pasture a limiting factor in wool growth then supplementary feeding of cystine to grazing sheep should result in increased wool production. Such an increase was obtained both in Australian tests (Ref. 27) and at Wye (Ref. 28) by feeding blood meal (80–85 per cent. protein, 2·7 per cent. cystine) to sheep, but in neither case could the improvement be definitely traced to the cystine. More recent Australian experiments in which the cystine was injected subcutaneously into the sheep, whereby increased wool growth was observed over a subsequent period of some three weeks, would seem to be more decisive ; but the work requires to be repeated and confirmed at other centres and also to be supplemented by more accurate and extensive data regarding the cystine content of pasture herbage under different conditions, before attempts at the commercial exploitation of cystine-rich foods for sheep feeding can be justified.

In view of the widespread deficiency of phosphorus in South African and Australian pastures the problem of the effect of this deficiency on wool growth has required attention in these countries, but the evidence so far obtained suggests that, if the protein supply is adequate, deficiency of phosphorus does not affect wool growth.

The question whether a particular diet contains sufficient protein for optimum wool production cannot be decided without taking into account the other ingredients of the diet, and in particular the carbohydrates, since if these are inadequate some of the protein will be used simply to provide some part of the maintenance energy requirements of the sheep and will thus not be available for wool production. Addition of carbohydrate to such a diet may thus lead to an increased wool growth. That such can indeed occur has recently been demonstrated by experiment (Ref. 29).

Turning to practical applications of the fundamental knowledge as to the influence of nutrition on wool production Fraser points out that although wool protein comes from food protein "it does not follow that under pastoral conditions it is always advisable to feed supplementary protein of good quality where increased wool production is desired. If pastures are deficient in minerals then additional protein will have no effect until the mineral deficiency is corrected, because until that is done the protein will not be eaten. Further, under drought conditions in warm climates, or winter conditions in cold climates, sheep will invariably lose weight where flock management is of the extensive range type. In these circumstances it is probable that the correct supplement to feed is a carbohydrate one. With a sub-maintenance diet carbohydrate will have a protein-sparing action and thus produce the same effect as supplementary protein, but at less cost".

In general, increased fleece weight is associated with increased length and increased thickness of the individual wool fibres, the latter being apparently more susceptible to nutritional influences than the length. The improvement of pasture, therefore, by improving the sheep's nutrition, is likely to give a larger sheep bearing a heavier fleece of longer staple and coarser fibre—a lowering of quality of wool that to some extent reduces the economic advantage of the pasture improvement. Australian experience shows, however, that this coarsening of wool, where it does occur, is not serious, and is more than compensated financially by the increased weight of clip.

V.—Food Fat and Animal Fat.

The tendency of the oils and fats of the food to impress their character upon the body-fat has always been a subject of interest to the nutrition investigator, and has now, with the

growing insistence upon high quality in animal produce, acquired a definite economic importance. The elements of the subject have been outlined in previous *Guides* (1931, p. 93; 1932, p. 111[1]) and we need only recall here that the firmness or softness of fats is largely determined by the proportion of acids of the oleic acid type present in them. The greater the proportion of olein present the softer is the fat likely to be; or if it be a food fat, the greater will be its tendency to soften the body-fat (or the butter-fat) of the animal. This is strikingly illustrated in the results of recent experiments at Cambridge with fowls (Ref. 30) which seem to be even more susceptible than the larger animals to these fat effects. Not only were the effects shown in this case by the body-fat, but also by the fat of the egg-yolk. Those interested in the scientific aspects of the differences in character between the body-fats of different animals will find much of interest concerning the body-fats of the hen in a recent paper from the Department of Industrial Chemistry of the University of Liverpool (Ref. 31).

From the same laboratory has come also a further report (Ref. 32) upon the body-fats of the pig which confirms the previous observations (see *Guide* for 1931, p. 93) that the outer layers of back-fat are always softer than the inner layers, which in turn are softer than the fat deposited round the kidneys. From older work the conclusion was drawn that this determining factor in the relative hardness or softness of the fats was the temperature of the site in which the fat had been laid down in the animal, this being recorded as 33·7°C. at 1 cm. below the skin, 39·0°C. at 4 cms. deep, and 39·9°C. in the rectum. The Liverpool workers, using more precise methods of investigation, have now been able to obtain a general confirmation of this conclusion, except that they do not find any regular increase of hardness of the fat on passing from the surface to the interior of the body. On dividing the back-fat of the pig into five layers (two above the "streak" and three below) and examining each layer separately, they found that the outermost layer was rather softer than the one immediately below it, but that the lowest three layers (below the "streak") were practically identical. The greater part of the back-fat was thus practically uniform in character, only the very outermost layer immediately under the skin showing any appreciable variation owing to the lower temperature to which it is exposed. To that extent, therefore, the results lend support to the advocacy of warm housing for the pig in winter. In contrast to this it is interesting to note that the hen, with its better-protected body, showed little variation in the character of the body-fat in different parts of its body (Ref. 31).

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[1] *R.A.S.E. Journal*, Vol. 94, p. 271.

Closely allied with the question of food fat and body-fat is the possible influence of food fat upon the secretion of milk-fat. On this point, although the evidence is clear that the food fat can exert upon the character of the milk-fat an influence similar to that produced upon the body-fat, it is more conflicting as to the possibility of its exercising an influence upon the amount of fat secreted by the milk glands. Most investigators have failed to detect even a temporary rise in fat secretion after additions of oils or oily foods to rations such as are commonly used in farm practice, although at very low levels of oil content such an effect can be induced. This general experience was confirmed in recent experiments in the Irish Free State (Ref. 33) in which, apart from codliver oil, neither vegetable, animal or fish oils nor oilcakes showed any specific quantitative effects on the percentage of fat in milk, except such as were associated with the changes in milk yield. Codliver oil, as others have also noted, tended to depress slightly the percentage of fat in the milk. As against these Irish tests experiments have been reported from the University of Minnesota (Ref. 34), in which definite rises in the fat content of milk were produced over short periods by additions of various fats and oils to a basal ration of lucerne hay, maize silage, oats, barley, maize, wheat bran, maize gluten meal, linseed meal and cottonseed meal. In different periods additions were made of butter-fat, lard, tallow, linseed oil, cottonseed oil, maize oil, groundnut oil, soya bean oil, and coconut oil, in amounts as high as 1¼–2 lb. daily. "In only one case, of the almost 200 times that the fat intake of individual cows was increased by more than ½ lb. daily, was there a failure to respond with an unmistakable increase in the fat content of the milk." Whether the fat were added to the ration or substituted for carbohydrates of equivalent energy value the result was the same. The amount of the change produced was to a large extent proportional to the amount of fat that was fed, and since the yields of milk were only slightly affected, the rise in fat precentage must have been due to increased secretion of milk-fat. A period of 12 to 24 hours elapsed after the fat was fed before its influence became observable in the milk, and this influence was maintained for 30 to 42 hours after the last fat was fed.

The two reports summarised are thus in direct contradiction and we are still left in doubt as to whether, and if so under what conditions, the feeding of oil or fat to cows on ordinary practical rations can exert a favourable influence upon the secretion of milk-fat. On the principle that one apparent success outweighs many failures the subject clearly needs still further investigation.

VI.—Digestion and Utilisation of Fibre.

The "fibre" (or "crude fibre") of a foodstuff is not a definite chemical compound, nor even a definite group of compounds (as are proteins and oils) but is that part of the organic substance of the food which resists the solvent action of acid and alkali when these are allowed to act on the foodstuff under certain standard conditions. At best, therefore, this fibre can hardly be easily digestible, and indeed in the early days of foodstuff analysis, when this conception of fibre was first introduced, it was anticipated that it would give a rough measure of the indigestible matters of the food, and was, therefore, frequently designated "indigestible fibre". Subsequent research has shown, however, that it cannot be so regarded, and one now treats it as a purely conventional item, useful as giving us a rough idea of the proportion of hard, tough, difficultly soluble material present in the foodstuff.

In chemical character it is mainly a mixture of celluloses and cellulose-like ingredients, products of lignification and encrusting substances (lignin, cutin, suberin, pectins) such as constitute the cell membranes and outer layers of the plants from which the foodstuffs are derived. Not only may it vary in character for any one foodstuff but even more as between different foodstuffs. These wide differences in the make-up of this fibre complex have a considerable influence upon the extent to which it can be digested by animals and man.

In striking contrast to the digestion of proteins, fats and soluble carbohydrates, which is effected mainly by the enzymes present in the digestive juices, the chemical digestion of fibre, in almost all cases where animals eat much plant food, is effected mainly through the agency of bacteria. Symbiosis with cellulose-digesting bacteria occurs widely in animals that subsist on plant food. In farm animals the bacterial digestion of fibre in the food plays an important part, both directly through rendering available some part of the energy of the fibre itself, and indirectly because this breaking down of the cell walls renders their valuable nutritive contents more easily accessible to the digestive ferments and, therefore, more fully available to the animal.

The bacterial digestion of fibre involves a certain amount of waste in the form of gases that the animal cannot utilise, and in other ways the assessment of the real value of fibre to the animal presents difficulties, so that the literature of the subject is somewhat involved and beset with contradictory observations; hence a recently published review of the whole subject by Prof. Mangold, of Berlin (Ref. 35) is very welcome and helpful. Some of the points of direct interest to practice in this review

may be summarised here, but the reader interested in the more scientific aspects of the subject must be referred to the original article.

Of our common farm animals a relatively high capacity for digesting fibre is shown by the ruminants (cattle, sheep and goats) and a distinctly low capacity by the pig, whilst the horse occupies an intermediate position between these two extremes. In all cases the physical character of the fibre influences its digestibility, the softer fibre of greenstuffs being better digested than the harder fibre of fodders and husks.

The advantage possessed by the ruminant for the digestion of fibre lies in the active bacterial fermentation that takes place in the rumen (paunch). In the case of other animals no appreciable digestion of cellulose takes place until the food reaches the cæcum and colon.

In the case of the pig the digestibility of the fibre of individual feeding stuffs may vary greatly according to the nature of the ration containing them. Thus for the digestibility of the fibre of rye meal results ranging from 2½ to 36 per cent. have been found in different experiments. Generally, however, wherever the conditions have permitted of reasonably accurate measurement, the digestibility of fibre by the pig has come out very low. Thus in a recent American experiment (Ref. 36) the fibre of oat husks and of alfalfa (lucerne) meal was digested by pigs of about 175 lb. live-weight to the extent of only 2 per cent., while even pure cellulose in the form of dried paper pulp showed an average digestibility of only 3·2 per cent.; individual pigs showed a range of 0 to 9·2 per cent. These figures for the pig may be contrasted with an average digestibility of the fibre of oat husks by the horse of 20 to 25 per cent. and by the ruminant of 45 to 50 per cent.

For a long time it was held that poultry had no power of digesting fibre, but investigations by improved methods have recently proved that such is by no means the case. "For barley, oats, peas and cabbage, fibre digestibility coefficients for fowls, pigeons, geese and ducks, of over 20 per cent., and for maize and barley as high as over 30 per cent. have been found" (Mangold). Great variations were found, however, in different varieties of the same cereal. Thus in the Cambridge experiments with oats Halnan found a variation in fibre digestibility by White Leghorns from 0 to 6·6 per cent.

In general, therefore, it may be taken as true of the digestibility of fibre in foodstuffs that, even with the same species of plant, the variety and origin, in addition to all other factors, are of importance. The same applies to the factors of individuality and nutritional condition in the animal itself. The nature and total amount of the ration in which the fibre is

consumed may also contribute to the variability, since the intestinal flora and, therefore, the conditions for the activity of the fibre-digesting bacteria will thereby be affected. Thus the addition of carbohydrates to the diet of a ruminant will lower the digestibility of the fibre.

It might be expected that the degree of mechanical division or grinding of the food would have an effect on the digestibility of fibre, despite the natural provision for achieving this end by chewing, rumination, etc. The experimental evidence on this point is not entirely concordant, but in the main some improvement in digestibility by the grinding is indicated. The greater benefit as a rule, however, is in the more effective utilisation of the digested material, since there is less drain upon it for energy to provide for the work of mastication, etc. The same probably applies to the various other methods of preparation (cooking, etc.) designed to soften the fibre.

Turning from the digestibility of fibre to its availability, or the use that the animal can make of the digested portion, the classic experiments of Kellner with fattening cattle gave for digested fibre a fat-production value equal to that of starch, about 57 per cent. of the available energy of the digested material being stored up as fat in each case. On this basis the utilisable energy of 1 gram of digested fibre is 3,599 calories.

In experiments of the same kind with pigs Fingerling found approximately the same value for the fibre, although the production value of starch in this case was appreciably higher than with cattle.

As to the effect of grinding in increasing the utilisation of foods (partly through increased digestibility) Kellner found that the production value of fodders steadily increased by cutting up to a point when they were reduced to about the state of fineness of oat chaff; Woodman found an increase of 15 per cent. in the feed value of ground as compared with whole barley; and Hansson an increase in the food value of maize of 5–6 per cent. by crushing, 10–12 per cent. by coarse grinding, and 15–18 per cent. by fine grinding.

VII.—Vitamins.

No attempt can be made here to do justice to the enormous volume of vitamin research that is reported year by year and we can only pick out a few items of interest relating to the two vitamins A and D, which more frequently than others seem to require the attention of the practical stock feeder.

Dunlop (Ref. 37) in pig-feeding experiments at Cambridge found that a ration of barley meal, middlings and fish meal was deficient in vitamin A for normal growth in pigs, as was also a

ration of cereals, soya meal and minerals. On these rations the pigs began to develop symptoms of paralysis, due to vitamin A deficiency, when they reached about 150 lb. live weight, or about 14 weeks after weaning. When vitamin supplements of orange juice, codliver oil or crystalline carotene were given to the affected animals they began to improve at once, recovered their appetites and the use of their limbs, and within five weeks were apparently normal.

Other pigs on the same rations did not suffer, but these had been better supplied with vitamin A during the pre-weaning period, and in some cases for some weeks after weaning. The conclusion is drawn, therefore, that when a vitamin A concentrate is fed in sufficient amounts during suckling, or for a month after weaning, the above rations are suitable for normal growth to bacon weights but provide only a small margin of safety, as the vitamin A reserves are almost exhausted when the animals have received the diets alone for 18 weeks. By prolonging the period of feeding the vitamin supplement normal growth is obtained and a greater margin of safety results.

It should be noted that the pigs in these experiments received no green food from birth, nor were they allowed out to pasture. Where litters are turned out to graze, and especially if they remain on pasture for four weeks or more after weaning, they will doubtless have secured from the grazing an adequate protection against subsequent vitamin shortage.

That the liberal supply of vitamin A to the mammalian mother provides no assurance that the offspring will start life with an adequate store in their bodies has been demonstrated in Cambridge experiments (Ref. 38). These experiments have been followed by further studies (Ref. 39) of the vitamin A content of colostrum and milk from 14 dairy shorthorn cows. The colostrum was found to be a far more potent source of vitamin A than either the placenta upon which the calf depends before birth or the normal milk which forms its sustenance later. The vitamin A concentration in colostrum may be, independently of season, from 10 to 100 times greater than that of the later milk from the same cow. The colostrum of heifers was on the average more than twice as rich in vitamin A as the colostrum of cows. The carotene content of colostrum may be as much as 70 times greater than in the later milk, except when calving occurs during later winter feeding.

In view of the wide use of fish-liver oils as sources of vitamins A and D some observations from the Torry Research Station, Aberdeen (Ref. 40), are of interest. The vitamin A content of fish-liver oils has been found to cover a range of at least 2,500 to 1, but no parallelism can be traced between the vitamin A and vitamin D potencies. Halibut-liver oil is by far the richest

known natural source of vitamin A which is available in quantity, but it has been found to vary in potency over a wider range than any other source, a range of more than 0·17–10 per cent. of vitamin A in the oil having been found. The oils also show well-marked and quite definite seasonal fluctuations in vitamin A, for which only tentative explanations can be given. The best oils from the standpoint of vitamin A content are most likely to be obtained from large halibut caught in northern waters in the late spring or early summer, and again in the autumn.

On the twin problems of colour and vitamin A content of milk which have assumed practical importance in recent years, data of interest are contained in a report on joint investigations by agricultural and biochemical workers in the country (Ref. 41). The replacement of up to 25 per cent. of the concentrated foods given to dairy cows in winter by artificially dried grass produced no appreciable improvement in the colour of the butter-fat, but when the replacement was increased to 50 per cent. a distinct improvement was secured. The inclusion in the winter ration of 40 lb. of silage made by the Virtanen (A.I.V.) process (see *Guide* for 1932, p. 121[1]) raised the yellow colour of the butter-fat to a high level, comparable with that obtained on the best pasture. More liberal use of the silage up to 70 lb. showed no further advantage either in the colour or vitamin A content of the butter-fat.

The silage feeding increased the carotene and xanthophyll contents of the butter to about three times those of butter from a similar group of cows on a normal winter ration without silage. At the same time the content of the true vitamin A was approximately doubled. The silage effects were obtained with Shorthorn, Ayrshire and South Devon cows. It is interesting to note that on a normal winter ration deficient in carotene the yellow colour of the butter-fat of Ayrshire cows fell more rapidly, and to a lower level, than with Shorthorn cows. Furthermore the improvement effected by the silage was greater with the latter, although the butters showed little difference in content of true vitamin A.

From the mass of reports dealing with other vitamin problems three have been selected for special comment. The first (Ref. 42) is of interest in view of the growing tendency to use germinated and cooked cereals in the feeding of live stock.

In this work at the University of Wisconsin it was found that immature yellow dent field maize promoted better calcification than corresponding mature maize of the same variety and grown under identical conditions. Sweet maize canned by a vacuum process also promoted better calcification than the seed from which it had been grown. The differences in calci-

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[1] *R.A.S.E. Journal*, Vol. 94, p. 281.

fying value were not due to more favourable calcium-phosphorus ratios, and, therefore, were presumably due to greater vitamin D efficiency. Germination of yellow maize, in the dark, for 95 hours had apparently no effect on its rickets-producing properties, nor had the soaking of whole kernels or the wetting of ground maize with subsequent drying. Heat treatment of ground maize at a temperature less than 50°C. did not alter its rickets-producing tendency, neither did germinated maize subjected to this treatment for two weeks undergo any change in this property.

The other two papers deal with the effects of different methods of drying fodders upon their vitamin D potency.

At the Washington Agricultural Experiment Station comparisons were made (Ref. 43) of the calcifying properties of green, artificially dried, and sun-cured pasture herbage. The pasture herbage used was a mixture of perennial and Italian ryegrasses with a little white clover, and represented herbage that was three weeks old. The artificial drying was done in a direct-heat rotary drier, with outlet temperature of 165–175°C. through which the material passed in about ten minutes. The sun-cured herbage was protected from leaching by rain or dew and the exposure to direct sun's rays of varying intensity averaged about 15 hours over a two-day period. These materials were incorporated in the rations at the rate of 3, 6 and 9 per cent. of the total dry matter. Even at the lowest levels the fodder in all three forms increased the calcifying power of the basal diet, and no material further improvement was effected at the 6 and 9 per cent. levels. The heat treatment in the rotary drier did not destroy the calcifying potency of the herbage, all three forms giving identical results. It must be borne in mind that the herbage used in these experiments was obtained and used in ideal conditions, not having been exposed to ordinary weathering.

In recent German experiments (Ref. 44) with lucerne more normal material was used. The hay was obtained under favourable weather conditions, being dried partly on hurdles and partly on the ground. Artificial drying was carried out partly in a drier of the Rema-Rosin type, in which the material was exposed for only a few seconds to a temperature of 760–800°C., and partly in a direct-heat band drier with inlet and outlet temperatures of about 200°C. and 40°C. respectively, the time of exposure in this case being about 25 minutes. Observations were made on the potency of the three products with regard to vitamins A, B and D. The long transport of the fresh green material from the farm to the laboratory caused difficulties, and despite elaborate precautions to avoid any change it seems certain that some loss of vitamin (especially A)

took place before the undried greenstuff could be fed. This doubtless explains why only very small quantities of this vitamin could be found in this material, whereas the artificial drying at the farm apparently caused little or no loss of this vitamin. Greater loss occurred by ordinary drying (hay-making), the hurdle-dried material showing only one-third, and the ground-dried material one-eighth, of the vitamin A potency of the artificially dried lucerne. Clearly, therefore, hay-making under unfavourable conditions must mean far greater losses of this vitamin. Expressed in international vitamin A units the artificially dried lucerne contained per gram 60 units, hurdle-dried 20 units, and ground-dried 7½ units.

The presence of vitamin D could not be detected in the fresh lucerne, nor could more than traces be detected in the artificially-dried material. Even in the ordinary hay only a small amount, corresponding to 0·3 international units per gram, could be detected, the hurdle-dried and ground-dried materials showing no difference in this respect.

The content of vitamin B1 also proved to be small in all cases, the loss as compared with the fresh lucerne being greatest with the ground-dried hay (37½ per cent. loss) and least with the artificial drying (17 per cent.). These losses were in part due to some loss of the finer leafy portions during drying, and would, therefore, have been much greater in bad weather. Similar results were obtained with reference to the B2 vitamin.

These results show clearly that badly-won hay may be extremely poor in vitamins, especially A and B, and even where large amounts of hay are fed the possibility of vitamin deficiency cannot be ruled out when the hay is of poor quality. Artificial drying in the modern drying plant will, on the other hand, apparently conserve the original vitamin supply of the fodder.

VIII.—Grassland Problems.

No field of applied nutrition research has received a more marked impetus in recent years than the study of grassland problems, and a steady flow of reports is now appearing annually from all parts of the world. From those that have come under review during the past year three groups have been selected for summary here.

Influence of Fertilisers.

On the Canadian Central Experimental Farm at Ottawa experiments were carried out during 1932 and 1933 to ascertain the influence of successive applications of nitrogen (as nitro-chalk) on the composition and yield of pasture herbage

under the close-grazing system of management (Ref. 45). Four plots were used, receiving one, two, three and four dressings respectively of nitro-chalk (160 lb. per acre) each year, between the end of March and end of August. The four plots were always cut at the same time, when the grass had reached a growth of approximately 7 in. The main results for the two seasons are summarised in the following table, which brings out the marked influence of nitrogen in increasing the yields of dry matter and protein :—

Year.	Dry Matter per acre. Number of Dressings.				Protein per acre. Number of Dressings.			
	1	2	3	4	1	2	3	4
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1932 . . .	2,651	2,871	3,220	3,519	614	668	737	823
1933 . . .	2,423	2,884	2,852	2,984	484	588	579	622
Total .	5,074	5,755	6,072	6,503	1,098	1,256	1,316	1,445

The detailed data of the experiments also confirmed previous results as to the high protein content of young grass, the individual samples showing from 19–30 per cent. of protein in the dry matter in 1932, and from 17–26 per cent. in 1933. They also demonstrate that an ample and well-distributed rainfall is practically indispensable for the successful operation of the close-grazing scheme of pasture management.

Fagan and his colleagues at Aberystwyth, in continuation of work noticed in previous Reports, have investigated the effect of manures on the nitrogen- and mineral-content of grass and clover species grown at different altitudes in the Welsh uplands, ranging from 300 to 850 ft. above sea level (Ref. 46). The material for the investigation was obtained from drilled plots of perennial ryegrass, cocksfoot, timothy, fine-leaved red fescue and Montgomery red clover, cut at approximately monthly intervals. In the second year after sowing two of the plots were dressed with superphosphate and kainit, whilst one of them received also a dressing of 100 lb. nitrogen per acre.

Of the grasses sown only fine-leaved fescue and cocksfoot made successful growth, and of these the former appeared the better suited to these conditions. The nitrogen- and mineral-contents of these two grasses on the uplands compared favourably with the same grasses grown on the lowland plots, which suggests that when suitable strains of suitable species are chosen these upland grazings can be greatly improved. It was only on those upland areas that received the complete dressings of manures, however, that produce comparable as to nitrogen- and mineral-content with that of the lowland plots was obtained, and even then the yield on the upland was much smaller than on the lowland.

The effect of the manures on the composition of the grasses was more pronounced on the upland than on the lowland plots, as was also the residual effect of the manures.

Though no lime was applied to the plots the effect of superphosphate in increasing the lime content of the herbage was quite definite, especially on the upland plots.

In a further paper from the same source (Ref. 47) data are given for the recovery of nitrogen in swards kept under the intensive grazing and manuring system, showing an average recovery of 59 per cent. during 1931, and 64 per cent. during 1932, or an average loss under the current rainfall conditions of 38·5 per cent. of the nitrogen applied.

Another contribution of interest that may be noted in this section is the further report by Elliot and Thomas on their application of modern methods of chemical analysis and assessment of nutritive values to the well-known Palace Leas plots at Cockle Park (Ref. 48). From their data they conclude that of the manurial treatments used on these plots the use of basic slag alone, or in conjunction with other fertilisers, has been the most effective treatment for the production of high quality as measured by analysis. When the relative efficiencies of the manurial treatments, in terms of nutritive value produced, are assessed on the basis of the total weights of digestible protein, lime and phosphoric acid produced per acre, the use of basic slag together with sulphate of ammonia and muriate of potash, or with either of the latter, has given the best results.

Palatability of Herbage.

The elusive factor of palatability of herbage has notoriously an important determinative effect upon the quality of grazings. Hitherto it has received little attention from the investigator, but during the past year several reports dealing with it have been issued and merit notice here.

From the Welsh Plant Breeding Station two papers (Ref. 49) on the subject have been published in the new *Empire Journal of Experimental Agriculture,* the first dealing with the relative palatability of miscellaneous herbs, grasses and clovers on widely differing types of grassland, and the second with the relative palatability of " seeds " mixtures. The mass and variety of information contained in the first paper does not admit of adequate summation and only a bare outline of the general features can be given. The miscellaneous herbs were found to be classifiable into highly palatable, moderately palatable and definitely unpalatable. The grasses showed variation in relative palatability, chiefly due to stage and type of growth and the presence of " burn ".

The choice of the grazing animal between miscellaneous herbs and grasses in lowland fields, and also between the individual species composing hill pastures, was found to be influenced markedly by the factor of " burn " on the one hand, and of winter greenness on the other.

The miscellaneous herbs are generally poorer in dry matter than the grasses and clovers, so that their presence means a lower production of dry matter, and judged by this standard is perhaps a doubtful asset.

In the experiments with seeds mixtures reported in the second paper it was found that timothy formed the basis of the most palatable mixtures, although when the species were tested in separate plots it was not the hardest grazed. Sheep grazed on plots sown with different mixtures selected mixtures as such rather than individual species from mixtures. Red clover is highly palatable to live stock when grasses are available along with it, but may be refused entirely on pure clover grazings.

In German tests along similar lines (Ref. 50) observations were made during free-choice grazing trials on 14 different grasses and five clovers, using cows, horses, pigs, sheep and goats. Cows and horses showed a special liking for grasses, whereas pigs and sheep preferred clovers.

In Massachusetts experiments (Ref. 51) the influence of manuring on palatability was observed on plots of grasses of different species grazed by cows on free-choice lines. First-year grass was equally palatable under the different manurial treatments, but in the second year the plots receiving nitrogen or minerals were grazed better than those which received no fertiliser, especially where the higher dressings of nitrogen were given. Stage of growth affected palatability, and it was only after growth had reached about 4 in. that the cows made selection.

Grazing Habits and Food Value.

Regarding the grazing habits of the dairy cow Swedish observers (Ref. 52) report that milking cows on pasture employed about half their time in effective grazing and half in resting and chewing the cud. The intensity of grazing was approximately the same during the night as during the day, periods of intensive grazing alternating fairly regularly with periods of rest. Cows weighing 520 kg. (1,144 lb.) and giving a about 10 kg. (22 lb.) of milk daily were found to be eating some 80–90 kg. (176–198 lb.) of greenstuff per day. This last figure is appreciably higher than English estimates.

An American report (Ref. 53) on the same subject gives more precise observations of the comparative grazing habits of cows subjected to two types of pasture management. Cows

subjected to rotational grazing spent on an average 28 minutes less in grazing and 38 minutes more in lying than similar cows on an open pasture where unrestricted grazing occurred. The former cows expended an average of 411 minutes daily in grazing and 192 minutes in lying. The average number of times that grazing and lying occurred in this lot was 8·83 and 3·13 respectively, as compared with 7·87 and 2·38 for those on the continuously grazed pasture.

As the grazing season advanced the cows on the rotational system expended less time in grazing and more in lying, whereas the reverse was the case with the other lot. Increasing the number of days that cows were maintained on a rotation unit effected a marked increase in the number of times that grazing occurred, but did not materially increase the average time expended in grazing. Cows that grazed on a plot for four days were lying on an average 25 per cent. less on the fourth day than on the first.

A decrease in live-weight accompanied an increase in the number of days that the cows were maintained on a pasture unit, the average decrease at the end of the second and third days being 10·5 lb. and 14·6 lb. respectively. There was also a significant decrease in milk production, which corresponded with an increase in the number of days that the cows were maintained on a rotation unit.

Lastly in this section a reference may be made to the Cambridge experiments on the utilisation of young grass by pigs (Ref. 54). In these experiments the digestibility by pigs of two samples of young pasture grass was determined. On the basis of dry matter the one sample contained 26 per cent. of crude protein and 16·7 per cent. of fibre, whilst the other sample, which was rather further grown, contained 16·8 per cent. crude protein and 19·4 per cent. fibre. With both samples the digestibility of the grass proved to be considerably less than that of the meal ration fed along with it, the organic matter of the latter being 85 per cent. digestible, whereas only 60–62 per cent. of the organic matter of the grasses was digested. Except for the crude protein, which was more digestible in the younger grass, there was little difference between the results for the two samples.

On the basis of these results Woodman estimates that 6·7 lb. of grass of this quality would be equivalent to 1 lb. of pig meal; or if we assume that a pig on full grazing might consume 12–14 lb. of grass this would represent a saving of 2 lb. of meal, as compared with the requirements for full indoor feeding. On the other hand, with this amount of bulky food passing through it there is the risk that the pig may not be able to take sufficient meal in addition to enable it to develop its full

possibilities of growth. To this may be added also the consideration that the grazing pig uses up a considerable amount of energy in roaming about and in biting off and masticating the grass, so that an appreciable part of the 12–14 lb. of grass consumed may be used up to provide the energy necessary for these purposes. The net feeding effect of the day's feed of grass may thus be appreciably less than the equivalent of 2 lb. of meal. This will apply even more with older grass, and on the average a figure of 8–10 lb. as the grass equivalent of 1 lb. of meal is probably nearer the mark.

As a digester of grass the pig is much inferior to the sheep, Woodman's data showing digestibility of the organic matter of young grass of 83·6 per cent. by sheep as compared with 61·9 per cent. by pigs.

IX.—Lucerne.

In last year's *Guide* (p. 121[1]) reference was made to the work on the composition and nutritive value of lucerne that had been initiated by Woodman and his colleagues at Cambridge, and a further report (Ref. 55) is now available, which deals with investigations of the 1933 crops. The first, second and third growths were studied under conditions of systematic cutting at the stages of (1) bud, and (2) flower. In addition to data on composition and digestibility, account was kept of the effects upon the yields of dry matter, starch equivalent and digestible protein, and on the health and vigour of the crop. The data have an added interest through being obtained in one of the driest and sunniest summers on record. Two separate crops grown in Cambridgeshire were dealt with, the one (Howe Hill) being a one-year-old stand on light, gravelly soil, and the other (Willingham) being a two-year-old stand on heavy "skirt" land.

The experimental data cannot be conveniently summarised here, and the reader may be referred to a semi-popular summary by Dr. Woodman published in the *Journal of the Ministry of Agriculture* for May 1934 (Vol. 31, p. 137).

In general the results led to conclusions substantially in harmony with those drawn from the previous year's trials with regard to the manner in which the composition of lucerne varies with the stage of growth at which the crop is cut, the nutritive value tending to fall steadily with advanced growth.

The drought severely affected the young crop on the gravelly Howe Hill soil, and this was reflected in a very high dry-matter content and a reduced protein content of the herbage, with a tendency for the lime content to rise as the drought continued. On the heavy Willingham soil, where the crop withstood the

[1] *R.A.S.E. Journal.* Vol. 94. p. 281.

drought very well, the composition of the herbage was normal, except for a very low fibre content (22·3 per cent. of dry matter) and very high lime content (4·6 per cent.).

The indications of the previous year that the third growth of lucerne tends to be richer in protein than the earlier cuttings were substantially confirmed, the explanation lying in part in the tendency of the later growths in the season to produce a higher proportion of leaf to stem.

Systematic cutting at the flowering stage produced the greatest weight of dry matter, namely at Willingham, 7,551 lb. of dry matter per acre. The three cuts at budding stage gave 84·4 per cent. of this yield, whilst the five cuts of pre-budding growth gave only 52·5 per cent. The differences were much less, however, when expressed in terms of starch equivalent and digestible protein, owing to the decrease of protein content and digestibility with advancing maturity.

Another comprehensive series of studies of the nutritive value of lucerne is reported from the Washington Agricultural Experiment Station (Ref. 56). In the ten tests reported in this paper the leaves (including blossoms) and stems of the crop were examined separately. It was found that 67–83 per cent. of the total protein of the crop was contained in the leaves, as well as 71–85 per cent. of the calcium, and 46–79 per cent. of the phosphorus. The leaves exercised a marked diuretic effect on lambs in the decreasing order of first, second and third cuttings.

The following average digestion coefficients were obtained in tests with 18 lambs and 3 cuttings of lucerne.

	Whole Plant. Per cent.	Stems. Per cent.	Leaves. Per cent.
Dry Matter	56·3	46·6	66·3
Crude Protein	69·7	51·1	77·4
Fibre	40·0	39·0	55·5
Fat	24·0	47·9	29·7
"Carbohydrates"	71·0	58·9	75·9

These data for the whole plant agree fairly well with those found by Woodman for lucerne cut at the flowering stage.

A given weight of leaves supplied about 3½ times as much digestible protein as the same weight of stems, and was less bulky. Moreover when stems (average of all three cuttings) were fed only 5·2 per cent. of the nitrogen was stored by the animal, as against 16·3 per cent. when leaves were fed. On the other hand the biological values of the proteins of stems, whole hay and leaves were assessed at 64, 51 and 41 respectively. The variation in these values is attributed to the differences in protein concentration of the stem, leaf, and whole-

hay rations, the leaf ration probably supplying an excess of protein.

Lambs fed stems of the three cuttings for ten days consumed 49·15 gms. of calcium and 7·76 gms. of phosphorus, and retained 1·29 gms. and 0·50 gms. respectively; fed similarly for ten days on a leaf ration they consumed 181·56 gms. calcium and 14·47 gms. phosphorus of which 24·22 gms. and 7·32 gms. respectively were retained. Clearly, therefore, lucerne leaves are important sources of calcium and phosphorus, despite the unfavourable ratio in which they are present.

X.—Cattle Feeding.

Under this heading a few miscellaneous items of reports and reviews on the feeding of cattle and dairy cows may be noted.

Rayns (Ref. 57) has summarised some of the results obtained during the past eight years in bullock-feeding experiments at the Norfolk Agricultural Station, using the records of 173 animals, and excluding all bullocks fed on deficient rations. The cattle, which at the outset were stores purchased in October weighing about 8 cwt., were housed in Norfolk fashion in semi-covered yards, and were, therefore, more exposed to the weather than stall- or box-fed animals.

Although the rations fed should "theoretically" have produced 2½ lb. live-weight increase daily (on Wood's standards) the average daily gain actually produced was only 2·1 lb. per head, the cattle taking on the average 22 weeks to fatten. The lowest live-weight gains were recorded in the first and third months of fattening. The daily live-weight gains were more uniform in the later than in the earlier stages of fattening.

As a rule the smaller stores took longer to fatten and required more increase in weight than the larger stores; the heavier stores, moreover, were the heavier when fat. High daily live-weight gains were associated with a short period of fattening. The bullocks which were heaviest at the finish recorded the greatest daily live-weight increases while fattening, but the weight of the store had little influence on the daily live-weight gain. There was no significant relation between the fat live-weight and the percentage of carcase weight to live-weight. On the basis of these results it is advised that in rationing bullocks on Wood's standards an average live-weight gain of 2½ lb. per day should be aimed at as standard.

Another report dealing with fattening cattle gives the results of three experiments at Auchencruive, designed to test the relative values of swedes, potatoes, dried beet pulp and silage (Ref. 58). In a test of *swedes* versus *potatoes* 24 bullocks

of about 8½ cwt. initial weight were used, housed in pairs in feeding pens. The potato group received a daily ration per head of 40 lb. potatoes (Kerr's Pink), 16 lb. hay and 4 lb. concentrates, whilst the swede group received the same ration except that the potatoes were replaced by an amount of swedes (Knockdon) supplying the same amount of dry matter as in 40 lb. potatoes, or roughly 76 lb. The potatoes were sieved to remove dry soil and then fed whole and unwashed, whilst the swedes were cut into "fingers" before being fed. Little change was made in the proportions of swedes and potatoes throughout the test, but the ration of concentrates was raised for both lots by ½ lb. every two weeks, thus reaching 6½ lb. in the twelfth and last week. Just at first the heavy allowance of potatoes tended to scour the bullocks rather badly, but this trouble gradually passed away. Over the twelve weeks the average live-weight gain for the potato group was 2·1 lb., and for the swede group 1·9 lb.; the latter, however, showing a slightly higher carcase percentage (56 per cent; 57·4 per cent.). The quality of the beef from both groups was entirely satisfactory, though the potato-fed carcases were reported "inclined to whiteness and more fatty".

The potato group on the average drank 6·07 gall. of water per head daily, and the swede group 2·55 gall. When to these amounts is added the water in the potatoes and swedes the total water supplies tallied almost exactly at 9.30 and 9·38 gall. respectively. The daily amounts of water taken in food and drink showed great variations, ranging from 5½–13 gall. in the potato group, and from 8½–10½ gall. in the swede group. The water consumption also tended to fall a little as fattening progressed. As a rough general guide, however, it may be taken that feeding cattle require (in drink and food) about 1 gall. of water daily per cwt. of live-weight.

The general conclusions can be drawn from this experiment that raw potatoes can be used in liberal quantities quite successfully for fattening cattle, and that, pound for pound, the dry matter of potatoes is practically equal in nutritive value to that of swedes.

A further comparison of *swedes* versus *dried sugar beet pulp* (non-molassed) was made on the same lines, but with rather heavier cattle (9¼ cwt.), divided into three groups of eight cattle each. The control group received a ration of 72 lb. swedes, 10 lb. hay, 6 lb. straw and 7 lb. concentrates, whilst for group II one-half of the swedes was replaced by 6 lb. dried beet pulp, and for Group III the swedes were entirely replaced by 12 lb. of dried pulp. On a dry-matter basis the equivalent of 72 lb. swedes would have been 8·57 lb. beet pulp; the 12 lb. actually

used represented equal money cost of pulp (at 85*s*. per ton) compared with swedes taken at 14*s*. per ton.

The beet pulp was all fed dry, the 12 lb. daily being given in three feeds of 4 lb. each, whilst the cattle had continuous access to water at drinking bowls. The bullocks were well forward in condition at the start and required only 10 weeks to finish.

The average daily live-weight gain per head for the control group (swedes only) was 2·60 lb.; for Group II (swedes and pulp) 2.47 lb.; and for Group III (pulp only) 2·66 lb. The cattle for Group III were the best finished and were ready for market at least a week before the trial concluded. This was confirmed by an advantage of 1 per cent. in carcase percentage. All the carcases were classified as first grade, and the dried beet pulp ration had no adverse influence on the colour of the fat. The average daily water-consumption records (total) for the three groups were 9·53, 8·80 and 8·53 gall. respectively, the heavier water consumption on the high ration of swedes being in accord with previous experience.

In the third experiment the issue of *sugar beet pulp* versus *silage* was tested with 24 cattle (average weight, 7 cwt.) in two groups, each group consisting of 4 bullocks and 8 heifers. The silage was made in a tower silo from a sowing of oats, beans, vetches and peas, and was of very good quality. Group I received a ration of 9 lb. dried beet pulp, 10 lb. hay and 5 lb. concentrates, whilst for Group II 6 lb. of the beet pulp in this ration was replaced by 20 lb. silage. Complete replacement of the pulp by silage was impossible with the young class of cattle used.

Though both rations supplied the same amount of dry matter, the silage ration, on account of its greater bulk, was evidently the more satisfying, and as this group of cattle never quite cleared up their full hay allowance the quantity of hay in their case was reduced to 8 lb. and ultimately to 7 lb. The feeding period covered 12 weeks, during which time the allowance of concentrates was raised to 7½ lb. The final results showed an average daily live-weight gain per head for Group I (beet pulp) of 2·23 lb. and for Group II (silage) of 2·01 lb. These differences were borne out consistently by the individual records, but it must not be overlooked that the silage group had eaten rather less dry matter, the difference in the amount of hay consumed being about 3 lb.

There is a belief that silage-fed cattle are often rather disappointing when killed but in this experiment the average carcase percentages were almost identical.

As was to be expected with the smaller animals used in this experiment the water consumption was less than in the other

tests, the daily averages (total) being 6·75 gall. for Group I and 6·41 gall. for Group II.

Summing up the practical moral of the whole series of tests the opinion is expressed that 20 cwt. of swedes can be replaced by 11 cwt. potatoes, or 10 cwt. silage, or 3 cwt. dried sugar beet pulp.

Turning next to matters relating to dairy cattle and milk production, mention may first be made of the valuable Report, No. 156 (Ref. 59) issued by the research laboratory of the Danish Royal Veterinary and Agricultural High School, which gives a summary of the 50 years' experimental work on milk production problems carried out by this institution. For those familiar with the Danish language this volume of 420 pages will prove a valuable mine of information.

The immediately preceding Report from this source (Ref. 60) deals with the results of the determination of digestibility of a number of foods by milk cows. In all, some 55 digestion trials were carried out, and the results given are the averages usually for 3, but in some cases for 4 or 5 animals. Red clover had a higher digestibility, protein content, and feeding value than rye grass or timothy. The latter two were equal in digestibility, but timothy had the higher protein content. Grass cut early was of greater feeding value than a second cutting at a similar stage of growth. The digestibility and feeding value of fresh pasture or hay decreased regularly with advance of maturity.

Fresh green herbage had a higher digestibility and feeding value than hay made from similar herbage cut at the same time. Although clover hay had 50 per cent. more protein than grass hay its net energy value was no higher. For the same crops the digestibility of silage made by the Virtanen or A.I.V. (acid) process was greater than that of silage made in the ordinary way; the former approximated in nutritive value to the fresh crop, whilst the latter had more nearly the value of hay. The digestibility of mangolds varied with the amount fed, the coefficient for the organic matter falling from 90 per cent. when 20 kg. (44 lb.) were fed to 85 per cent. when 60 kg. (132 lb.) were fed. The reduction was shown mainly by the crude protein and fibre. The data obtained with decorticated oil cakes agreed fairly well with those given in Kellner's tables, but for undecorticated cakes, barley and bran they were appreciably lower.

Passing from Denmark to America a note may be made of recent American determinations of the maintenance requirements (per 1,000 lb. live-weight) of the dairy cow (Ref. 61) in which from feeding experiments under practical conditions an average figure of 5·972 lb. of total digestible nutrients was found. This figure is much lower than Morrison's standard of 7·925 lb.

and is also lower than either Kellner's or Armsby's standards of 6·673 and 6·456 lb. respectively. On the other hand the new figure, 5·972 lb., is close to Mollgaard's standard of 5·860 lb., and to Hansson's standard of 5·638 lb.

As the average of eight calorimetric determinations a somewhat lower figure of 5·551 lb. was found, which is slightly higher than the average 5·260 lb. of seven similar determinations carried out previously. Taking the more recent of the above data an average of 5·75 lb. of digestible nutrients per 1,000 lb. live-weight would appear to be not wide of the mark.

Lastly a brief reference may be made to recent data from America on the water requirements of calves and dairy cows (Ref. 62). Calves receiving liquid milk consumed little free water until about 8 weeks old. As the amount of milk was reduced the calves drank enough water to compensate for the lower amount of water received as milk. A plentiful supply of water is important for calves not receiving liquid milk and for all calves over 8 weeks old. Free water drunk weekly per calf in these tests averaged 0·5 lb. at 4 weeks, 15·3 lb. at 8 weeks, 46·2 lb. at 12 weeks, 126·7 lb. at 20 weeks, and 233.6 lb. at 26 weeks. After the 10th week there was a constant relationship between total water intake, body weight and dry-matter consumption.

In the tests with dairy cows the addition of succulent foods to the ration caused a reduction in the amount of water consumed, but the total water intake remained about the same. High-producing cows (82 lb. milk) drank about 19 gall. of water daily. Under relatively similar climatic and feeding conditions the total requirements of dairy cows seem to depend on the milk yield plus a fairly constant amount of water per pound of dry matter consumed, this constant being about 3·7 lb. whether the cows are low, medium, or high producers.

XI.—Pig Feeding.

Two recent reports summarise the information obtained in several years' experimental work carried out by the Institute of Animal Nutrition of the Royal Agricultural College of Norway. The first of these (Ref. 21) gives information on the food requirements of brood sows and litters, based upon three years' control tests. An interesting point is that during the 7th to 8th week of suckling the piglet takes about two-thirds of its total food requirements from the trough, which, if correct, would seem to afford justification for the common practice of weaning at 8 weeks old, since at this stage the piglet will give 1 lb. of live-weight increase for little more than 2 lb. of meal whereas the sow will require fully 3 lb. to produce the same increase in the litter.

The maintenance requirement of the brood sow was found to be 1·2 food units per day at 150 kg. live-weight, 1·5 food units at 200 kg., and 1·7 food units at 250 kg. (These data may be converted into pounds of meal and pounds live-weight respectively by multiplying by 2·2.)

During gestation it was found adequate to allow the sow about ½ food unit per day (in addition to the maintenance allowance) if in fair condition, or double this allowance if very thin. On the average the total daily food during this period amounted to 2–2¼ food units (say 4½–5 lb. meal). The protein required was 200–250 gms. per day, or 100–120 gms. per food unit.

During suckling the sow requires, in addition to maintenance, an allowance of 0·5–0·6 food units per pig daily, the lower figure being used with large litters (over 10) or with slow-growing pigs, and the higher figure for litters up to 10 pigs with a good rate of growth. Protein should be provided at the rate of 120–130 gms. of digestible protein per food unit.

In the second paper (Ref. 63) data are given for the milk yield of the sow which, for the two animals tested, was estimated to be 9·6 kg. (21·1 lb.) per day during the first three weeks in one case and 8·7 kg. (19·1 lb.) per day during the first 8 weeks in the other. The former is reckoned as being equivalent in proportion to body weight to a yield of 500–600 gall. in a cow.

This report also includes an account of an experiment dealing with the possibility of warding off anæmia from the litter by dosing the sow with iron. The test was made with 47 sows, 24 of which were given a mixture of iron and copper sulphates from conception until weaning, the daily dose of iron being about 0·5 gm. per head and of copper about 0·06 gm. The young pigs were given the same mixture from two weeks of age onwards, the daily dose being 0·04 gm. iron and 0·005 gm. copper. The treatment did not affect the number of pigs per litter, but the number born dead or dying during the suckling period was considerably greater in the iron group than in the control litters. The rate of growth of the young pigs was also slightly better in the latter case, so that the dosing of the sow with iron would not seem to be desirable.

In a third paper from the same source (Ref. 64) data are given for the mineral requirements for normal growth of young pigs based upon data from 472 pigs from birth to 26 weeks old. The body increase of the young pig contains on the average 1–1·2 per cent. of lime (CaO) and about the same proportion of phosphoric acid (P_2O_5). An animal that is making an average live-weight gain of 400 gms. (0·9 lb.) must, therefore, store up daily 4·0–4·8 gms. each of these two minerals. If the food consists entirely of cereal meals and oilcakes there may be

an appreciable shortage of lime, and growth is checked. The common assumption that a ration of cereals and separated milk does not require any supplement of lime is described as incorrect. If the milk is being properly rationed even quite large pigs will not be getting more than 3 litres (0·6 gall.), which will only supply about 5 gms. of lime (CaO). On the other hand it is a mistake to give too much lime. Even if only cereal meals are being fed the lime supplement for the young pig should not be more than 20–25 gms. (¾ oz.) of finely-ground limestone. A supplement of phosphate is usually not necessary if the food consists mainly of cereal meals, but if roots or potatoes are being fed liberally it will be desirable to add a little potassium phosphate.

The vexed question of the relative merits of animal and vegetable protein supplements to cereal meals for pig feeding has been the subject of co-operative experimental work at six centres in Germany (Ref. 65) and although the scale of operations at the various centres was too small to warrant the expectation of decisive results, the concordance of the various sets of comparisons is such as to give an impression of validity to the general conclusions drawn. The experiments were designed to compare cod meals (air-dried and steam-dried), herring meals, and vegetable protein meals (mainly mixtures of extracted soya meal and dried yeast), each being used in quantities that supplied the same amount of digestible crude protein as in 300 gms. of the herring meal. Along with these meals a fixed daily ration of 700 gms. of barley meal was given, and the pigs were also given potatoes (steamed or as dried flakes) *ad lib.* Each experimental group consisted of 5 to 7 pigs, of about 55 lb. initial live-weight, and the duration of feeding varied from 100 to 140 days at the different centres. In most cases additions of chalk and salt were made to the rations in which only vegetable protein concentrates were used, but the proportions of these additions were much smaller than is customary in England. The pigs were entirely confined and no greenstuff was given, and although the possibility of mineral and vitamin deficiencies is discussed in the report and dismissed as improbable, it cannot be ruled out in the light of some of the experience recorded.

At every centre the lowest average gain in live-weight and the highest ratio of food-consumption to live-weight gain were recorded by the group that received the vegetable protein supplement. These pigs ate much less food than the rest, the blame being commonly attributed to the bitter flavour of the dried yeast. The results with the three types of fish meal tested did not show any significant differences, nor was any taint discernible in the carcasses, though reported in many

cases in the liver and brains. In these cases the intensity of the taint appeared to rise with the oil content of the fish meals.

The question of the quantity and quality of the protein supply to the pig is most important in the period immediately after weaning, which is notoriously the critical part of the commercial pig's career. About 40 per cent. of the dry matter of sow's milk is protein, and to provide a meal substitute equivalent in quantity and "quality" (as to amino-acids) has hitherto proved an impossible task, an approximation being the best we can hope for. This particular problem has received attention at several experiment stations, and at the Macdonald College in Canada a protein-mineral supplement has been devised for which excellent results are claimed (Ref. 66). This supplement consists of tankage (meat meal) 40 per cent., fish meal 20 per cent., linseed meal 20 per cent., steamed bone flour 10 per cent., ground limestone 7·6 per cent., salt 2 per cent., and ferric oxide 0·4 per cent. Average samples contain 43·4 per cent. crude protein, 7·6 per cent. oil, and 28·2 per cent. total minerals. Additions of codliver oil to the supplement did not increase its efficiency. A typical ration for the first month after weaning as used in the Canadian experiments is maize meal 25 per cent., barley meal 20 per cent., middlings 25 per cent. and 30 per cent. of the special protein mineral supplement. The proportion of the last-named item is more than double what is used in English practice, but the results quoted are certainly outstanding. In a very carefully conducted comparison of the Macdonald supplement against skim milk powder, in which the pigs were confined to and fed in individual pens, the two lots (10 each) gave average live-weight gains for the 32 days after weaning of 1·42 lb. and 1·47 lb. per pig per day respectively, the skim milk lot showing a 3 per cent. advantage in efficiency of utilisation of food. In a second experiment in which the replacement of limestone in the Protein Supplement by alfalfa meal was studied the daily live-weight gains over 30 days from weaning were 1·42 lb. (limestone) and 1·36 lb. (alfalfa).

On the average of all feeding trials carried out at the Macdonald College since the Supplement was first used in 1928, the average daily gain for the 30 days following weaning has been 1·28 lb., which is certainly more than ¼ lb. per day higher than is commonly expected for pigs of this age. These data certainly give cause for some re-examination of our British practice. Whether a complex and expensive supplement of this character has any advantage for young weaners running out on grass remains to be tested, as also whether under these conditions the proportion required may not be considerably reduced. In a Harper Adams College experiment (Ref. 67) weaners that were given day-pasturage for 4 weeks and 8 weeks

made better gains during these periods than others similarly fed but confined in sties and yards.

XII.—Horse Feeding.

For experimental data on the nutritive requirements of the horse we are entirely dependent upon foreign sources, the subject never having attracted the interest of investigators in this country. In recent years much work on the subject has been done at the experimental station of the University of Breslau and further reports are again to hand (Refs. 68, 69).

In the first report, along with a large mass of data collected from farms, the results of numerous horse-feeding experiments are given from which a few items of interest may be quoted.

The milk yield of mares was found to range from 12–15 litres (2·7–7·7 gall.), which is much higher than is commonly assumed. Movement of horses at pasture amounted to about 4–6 kilometres (2½–3½ miles) per day, being higher in dull weather and after rain than on hot days. The food intake of two-year-old Belgian colts (about 14 cwt. weight) at pasture was about 40 kg. (88 lb.) in 24 hours. Less water was drunk at pasture than in stalls, but on hot days reached 35 litres (7·7 gall.). Of the grasses eaten preference was shown for perennial ryegrass, cocksfoot, red fescue and smooth-stalked meadow grass.

Horses digested 53·8 per cent. of the dry matter of the pasture, 58·9 per cent. of the organic matter, 70·7 per cent. of the crude protein (68·5 per cent. true protein), 48·1 per cent. of the crude oil, 33·4 per cent. of the fibre, 66·4 per cent. of the "carbohydrates" and 63·8 per cent. of the sand-free mineral matters. The pasture herbage in question had a starch equivalent of 9·76 per cent., including 2·28 per cent. of digestible protein, giving a protein ration of 1 : 4·3.

In the second Breslau report data are given for the digestion of mixtures of green lucerne and clover and of green oats by working horses. The average results for the oats and for the first cut of the lucerne-clover mixture agreed closely with the data given above for pasture, except that a higher digestibility was found for the fibre (46·9 per cent.; 43·7 per cent.). The third cut of the lucerne-clover mixture was more digestible all round than either the first cut or the green oats, the digestion coefficients of the organic matter being 66·4, 56·8, and 56·9 per cent. respectively. The leguminous fodder showed the further advantage over the oats of being richer in protein and lime. If the lucerne-clover fodder was cut in a wet condition its general digestibility fell by 20–30 per cent., that of the fibre falling by 45 per cent.

Danish experiments (Ref. 70) on the food requirements of the draught horse have led to the conclusions summarised in the appended table, the first set of data being taken from previous experiments described in the 147th Report from the Danish station, and the second set from the more recent work at Turborg with which the 158th Report deals. The third and fifth columns give the distances covered in kilometres per day.

Live Weight. Kg.	147th Report. Food Units per day.	Km. per day.	Turborg. Food Units per day.	Km. per day.
650–675	8·8	(15)	9·4	18
675–700	9·0	(15)	9·5	17
700–725	9·2	(15)	9·4	16
750–775	9·7	(15)	9·5	13
775–800	10·0	(15)	9·3	13

XIII.—Poultry Feeding.

The mass of reports on poultry feeding published annually does not lend itself to effective summary, especially in view of the great diversity of breeds, methods of management, environmental and other factors by which the validity of the results for general application may be affected.

Under our own conditions, however, special interest may be claimed for the experimental work of the Hillsborough Experimental Station of the Ministry of Agriculture for Northern Ireland. The recent report from this Station on the question of protein supply to the laying hen has been touched upon in an earlier section (p. 302, Ref. 25). In a further report (Ref. 71) the question of the role of salt in the nutrition of the chick and the laying hen is dealt with.

In previous experiments the efficiency of extracted soya meal as protein supplement to a basal feed of cereal meals and grain, plus adequate minerals, had been demonstrated and this was, therefore, used throughout the salt experiments as the sole supplement where any protein supplement was required.

Starting with a mineral mixture of steamed bone flour, muriate of potash, common salt, sulphur, iron oxide and potassium iodide, the effect of omitting each ingredient in turn was tested, and both with chicks and with laying hens the conclusion was reached that salt was the only one of these various mineral additions that could not be safely dispensed with. The necessity for a lime supplement was taken for granted, but this was provided for apart from the general mineral supplement. It must also be kept in mind that the birds had access to grass runs.

The salient features of the chick-rearing experiments were, on the one hand, the good growth and efficient utilisation of food

in all groups receiving salt, and, on the other hand, the poor growth, disastrous susceptibility to disease, inefficient utilisation of food, and retarded sexual maturity of the pullets in all groups from whose ration salt (or other sodium supply) was absent. The other ingredients of the "complete" mineral mixture clearly served no useful purpose, and had no apparent effect on the birds, either with or without salt.

Salt is a chemical combination of the two elements sodium and chlorine, and from these experiments it would appear that the deficiency of the basal cereal diet that the addition of salt remedies is one of sodium rather than of chlorine. Addition of protein concentrate (soya meal) to the diet did not effect any improvement in the absence of salt. There was very striking evidence, however, that grass plays an important part in helping to balance a ration that is deficient in sodium, this being reflected very clearly in the greater efficiency with which the birds utilised their feed. The added salt need not amount to more than 0·5 per cent. of the mash, no further improvement being effected by giving more.

Precisely similar conclusions were arrived at in the experiments with laying hens, the cereal mash plus 0·5 per cent. of salt giving satisfactory egg-production and keeping the birds healthy and of good body weight. When salt was omitted, however, the rate and value of the egg production fell off, the size of the eggs decreased, the birds lost weight and were prone to cannibalism, particularly when they were deprived of access to their grass runs.

No increase of egg production followed either more liberal salt supply or increase of the soya meal supplement. The omission from the mash of muriate of potash, iron oxide, sulphur and potassium iodide was without effect on either health or egg production; as was also, with one exception, the omission of steamed bone flour. In the one exceptional case the birds which did not receive the bone flour laid fewer eggs, but otherwise as to size of egg, health and body weight were just as good as the comparison group that received the bone flour. The inclusion of ground carbonate of lime in the mash was without any apparent effect.

Bearing closely upon the subject of the utilisation of food by poultry kept under intensive conditions is that of the heating or ventilation of poultry houses. Since the scientific regulation of these must clearly be based upon the heat, gas and water exchanges of the fowls an American report (Ref. 72) in which such data are given for chickens, ducks, geese and turkeys from the time of hatching to maturity, may be commended to the notice of designers of poultry housing.

XIV.—Individual Feeding Stuffs.

Sugar Beet Tops.

On the average of three years' experiments with sheep at the Norfolk Agricultural Station (Ref. 73) it was found that beet tops were roughly equal in feeding value to swedes when fed on the ground. This agrees closely with the results of earlier Norfolk trials (Wood) in which the swede equivalent of a ton of beet tops was assessed at 1·13 ton. The figure for individual years in the two sets of experiments ranged from 0·76–1·46 ton. An allowance of 2 oz. of chalk per sheep per week was included with the dry food.

From a Danish experiment with cows (Ref. 74) it was concluded that 1·3 kg. of sand-free dry matter of clean beet tops was equivalent to 1·0 kg. of dry matter in mangolds. The content of digestible true protein in the tops was 1·3 per cent. The cows ate the tops readily, and in the quantities used, which went up to 53 kg. (117 lb.) per cow per day, with an addition of 1–2 gms. of chalk per 1 kg. of tops, no digestive disorder was experienced. There was a tendency to produce taint in the milk, though not so pronounced as with ensiled beet pulp (see below). No detrimental flavour was noticed in the butter, but the consistency was softer than that obtained when swedes were fed.

Sugar Beet Pulp.

The same Danish report contains the results of three comparisons of ensiled sugar beet pulp with mangolds. On the average 0·8 kg. of pulp dry matter was found to be equivalent to 1·0 kg. of mangold dry matter. The content of digestible true protein was 0·6 per cent.

The cattle ate the ensiled pulp readily and without apparent discomfort, but some lowering of fat percentage in the milk occurred during the pulp-feeding periods. The evening milk, drawn 2–3 hours after feeding the pulp, was distinctly tainted whereas the morning milk, drawn before feeding the pulp, was practically unaffected. By giving the afternoon feed of pulp immediately before milking the trouble was almost eliminated.

Similar comparisons of dried beet pulp with mangolds fed to milch cows have also been carried out at the Berlin Agricultural High School (Ref. 75) and it was found that 40 kg. (88 lb.) of mangolds could be replaced by 7 kg. (15½ lb.) of dried beet pulp without appreciable effect upon either the quantity or quality (fat) of the milk.

In stall-feeding experiments in the Irish Free State (Ref. 76), involving a total of 147 bullocks in four seasons, it was found that when a basal ration of hay and roots was supplemented by a

mixture of 2 parts oats, 2 parts maize meal and 1 part decorticated cottonseed meal, "sugar pulp" (by which presumably is meant dried beet pulp) could be used safely to replace all the maize and part of the oats. The pulp was fed so that 11½ lb. replaced 10 lb. of maize or 11½ lb. oats. When the pulp was used in large amounts, up to two-thirds of the concentrates, it was found advisable to use linseed cake or some other high-grade oilcake for the last three weeks of fattening.

The fundamental nutritive value of dried beet pulp for cattle and pigs has been determined by Fingerling (Ref. 77) by means of balance experiments on the lines followed by Kellner. With cattle the production starch equivalent of the dry matter of the extracted pulp was found to be 55·7 per cent., and of unextracted sugar beet 54·7 per cent. With pigs the figure for the latter was 75·4 per cent., thus confirming the high digestibility figures for dried pulp obtained with pigs at Cambridge some five years ago (see *Guide* for 1929, p. 108).

Marrow-stem Kale.

The brief notes on marrow-stem kale given in last year's *Guide* (p. 141[1]) may be supplemented by further data from a review of recent German experimental work (Ref. 77). The composition is apparently far more variable than the data given last year would suggest, figures for the dry matter as wide as 7·3 and 17·5 per cent. being now quoted, with corresponding variations in the individual ingredients. Similar differences were found with other forms of kale. The fibre content of the stem increases with advancing age, but such does not appear to be the case with the leaves, which are at all stages richer in protein and lower in fibre than the stems, and correspondingly more digestible. On the average of many samples the leaf forms 43 per cent. of the weight of the plant in the case of marrow-stem kale, and contains three to four times as much digestible protein as the stem.

The digestibility of the leaves is much the same for all varieties of kale, and is very high, being commonly in the region of 90 per cent. Very young stems are almost as digestible as the leaves, but fall off considerably in digestibility and nutritive value as the plant grows. The nutritive value of the whole plant is thus largely affected at each stage by the proportion of leaf to stem, and falls as the plant grows.

Feeding experiments have established its value for milch cows up to a limit of 40 kg. (88 lb.) per cow per day, but special care is needed in feeding it if tainting of the milk is to be avoided. Being richer in protein than mangolds or swedes less protein need be supplied in the concentrates.

[1] *R.A.S.E. Journal*, Vol. 94, p. 301.

Favourable experience in its use for pigs and poultry is reported, but for these classes of animal only the leaf can have much value.

Separated Milk.

The composition and, therefore, the nutritive value, of separated milk varies somewhat according to the proportion of fat in the milk from which it is derived. According to Danish estimates (Ref. 78) the energy content of the separated milk rises by about 22 calories for each 1 per cent. increase in the fat percentage of the whole milk; thus from milk containing 3 per cent. fat the skim milk yields 365 calories per kg., and from milk with 5 per cent. fat, 409 calories. Expressed in Scandinavian food units the number of F.U. per 100 kg. of separated milk rises 1 F.U. for each increase of 1 per cent. fat, the value of the separated milk from milk with 3 per cent. fat being 16 F.U. per 100 kg.

Whey.

In a summary of German experience in the feeding of whey to pigs (Ref. 79) it is stated that pigs of 50–100 kg. (110–220 lb.) will consume 8–12 litres (2–3 gall.) of whey daily, and older animals have been known to take as much as 25–30 litres (5–7 gall.) in a dry summer. Whey alone, however, is not sufficient to effect economical growth, and the best proportion of meal to whey will depend on the age of the pigs and the relative cost of the foods. The meal for pigs under 50 kg. (110 lb.) live-weight should include a protein supplement (say ½ lb. fish meal per pig per day) in view of their relatively small consumption of whey. In view of the tendency of whey to produce soft fat it is recommended that the quantity should be reduced during the last three weeks before slaughter and correspondingly more meal fed. It is definitely advised that whey should not be fed to breeding stock.

Wheat Milling Offals.

The changes in flour-milling practice since the War have introduced considerable uncertainty as to whether the older analyses for milling offals (or wheatfeeds) of various classes are really applicable to the materials now being sent out from the mills. Taking fibre content as a convenient basis of differentiation of the various grades of offals, Woodman, in 1923, from the examination of a considerable number of samples arrived at the average figures for bran, middlings and fine middlings, of 10·90, 6·28 and 2·48 per cent. fibre respectively. More recent investigations of the subject have been made by the Research Associa-

tion of British Flour Millers, on which a report is now available (Ref. 80). In the first series of analyses made in 1927, 105 samples were examined, which, though sold under 15 different designations, were found to fall into three fairly well-defined classes that may be called bran, coarse middlings and fine middlings. For the bran samples the range of fibre content was from 7·7–10·3 per cent., no difference in this respect being shown between "broad bran" and ordinary bran. The mean fibre content was 8·9 per cent. This fall in fibre content as compared with the older average is attributed to change in milling practice whereby a proportion of material that formerly went into middlings now remains in the bran. The second group of samples ("coarse middlings") ranged in fibre content from $4\frac{1}{2}$–$7\frac{1}{2}$ per cent., with a mean of 6·0 per cent., whilst the third group ("fine middlings") ranged in fibre content from 2·4–4·2 per cent., with a mean of 3·1 per cent.

A further examination of the position as regards coarse middlings was made in 1930–32 and revealed that on the whole no appreciable change in the character of this article had taken place, the average fibre content still remaining at 6·0 per cent.

In view of the growing practice among millers of making a "straight-run" middlings a new investigation confined to fine wheatfeed was carried out in 1933, and gave fibre figures ranging from 3·8–6·7 per cent., with a mean of 5·1 per cent. For the large number of mills from which samples were drawn the combined outputs of straight-run middlings represented 80 per cent. of the total output of home-milled fine wheatfeed from these mills, and the proportions into which the total offal output of British mills now falls is given as approximately, bran 40 per cent., straight-run middlings 45 per cent., fine middlings 5 per cent., and coarse middlings 10 per cent. With 85 per cent. of the total production of wheatfeed falling into the two categories of bran and straight-run middlings the trade has clearly undergone a considerable revolution from the position of some ten years ago when the bulk of the middlings on the market were of the coarse middlings type, with its $6\frac{1}{2}$ per cent. of fibre. To-day the predominant grade available is straight-run middlings with about 5 per cent. of fibre. Material of this character is practically no more fibrous than average barley meal, is much richer in protein, and must, therefore, rank fully as high as a concentrated food.

Wheat and Rye for Pigs.

An uncommon type of experiment is reported from the Animal Physiology Institute at Budapest (Ref. 81), the object of which was to obtain information on the fundamental biological

qualities of wheat and rye. In order that these cereals might serve as the sole food of the pigs a rather primitive, slow-growing Hungarian type of pig was used, whose protein requirement could be met by a pure cereal diet. Comparisons were made of a pure wheat ration, pure rye, and a 1 : 1 mixture of wheat and rye, the only addition being a little (1·5 per cent.) calcium carbonate. Two pigs (gilt and castrated boar) from a single litter were placed on each diet. The pigs, which were about three months old at the start, weighed 20–26 lb. and were fed for 290 days, being allowed to take as much food as they would eat.

In the whole period the wheat pigs consumed 1,246 lb. per pig, the rye pigs 667 lb., and the wheat-rye pigs 986 lb. The increases in live-weight per 100 lb. food consumed were 24·01, 19·25 and 23·29 lb. respectively. The differences in the utilisation of the food were evident from the start, and were reflected in the conformation of the pigs, the rye pigs steadily developing the long-legged, narrow-bodied character of the slower-growing pig. More characteristic still was the earlier development and greater intensity of sexual activity in the rye-fed pigs. In the case of the rye-fed gilt " heat " started quite early and recurred frequently with marked intensity, whereas the wheat-fed gilt scarcely showed any sign of it at all, and the wheat-rye gilt was intermediate in this respect. In the rye-fed gilt every part of the sexual organs was greater in proportion to body-size than in the case of the other two gilts. The total weight of the sexual organs of the rye-fed gilt was twice as great per 100 lb. body weight as in the other cases, and its ovarian substance consisted mainly of Graafian follicles, whereas in the wheat-fed gilt *corpora lutea* predominated.

The rye-fed gilt also showed a more active temperament, in striking contrast to the wheat-fed gilt which spent most of its time lying down, the wheat-rye gilt being intermediate also with regard to this characteristic. The greater physical and sexual activity may account partly for the rye being less efficient for growth purposes than the wheat, this receiving some support from the better rate of growth shown by the castrated hog than the gilt on the rye diet and the wheat-rye diet, whereas the opposite was the case on the pure wheat diet.

Starch Equivalent of Barley Meal.

A further addition to the scanty data on the fundamental production values of foodstuffs for pig-feeding has been made by Fingerling (Ref. 82).

Experiments with bullocks and pigs in a respiration chamber showed that ground barley is equally digested by both types of

animal. There was only a small difference also between the starch equivalent obtained, namely 81·7 per cent. with bullocks and 85·3 per cent. with pigs. In both cases the values found were identical with those calculated from the digestible composition of the barley, or in other words the availability coefficient of the digestible matter was 100 per cent. Since the pig uses starch more efficiently than the bullock the above data imply a similar superiority in the utilisation of barley meal, and the experimental data indicate that the pigs used 32·6 per cent. more of the available energy and gave a 33·7 per cent. higher gain.

Codliver Oil for Pigs.

The special merit of codliver oil as a food lies mainly in its content of vitamins A and D, and the necessity for its use turns largely, therefore, upon whether the pig's ration is adequate with respect to these vitamins. Practical opinion as to the need for it is conflicting and is doubtless influenced by the greatly varying conditions under which pigs are kept. That the predominant factor is the degree of exposure of the pigs to direct sunlight seems probable from experiments recently carried out by the Animal Nutrition Department of University College, Dublin (Ref. 83).

These six experiments were conducted in part under what are described as "the most adverse conditions likely to be found in general farming practice" and the conclusion is drawn that "in this country the addition of codliver oil to the diet of the pig, except in very rare instances, serves no useful purpose". Even pigs born in the autumn did not show any benefit from codliver oil except when direct light was effectively excluded from the pens. Pigs are so sensitive to the beneficial effects of sunlight that a very limited amount of it, even in the diffused condition, obviates the necessity for using codliver oil in the ration. If conditions exist which are likely to cause rickets, "and such conditions are rarely found", 1 per cent. of vitamin-potent codliver oil should be added to the meal mixture. It should be noted that throughout these Irish experiments the rations included a substantial proportion of yellow maize meal, which would probably ensure an adequate supply of vitamin A to the pigs.

The general conclusions formulated above are fully borne out by experience at the Harper Adams Experimental Station, where the pigs get ample exposure to direct light.

Dried Grass for Pigs.

The comparatively low digestibility of artificially dried pasture grass by pigs that was found in the Cambridge trials

(Ref. 54) is substantially confirmed by the final report (Ref. 67) on the Harper Adams College feeding experiment to which a preliminary reference was made in last year's *Guide* (p. 120[1]). "On reviewing the whole experiment we are left with the general impression that the possibilities of replacement of sharps in pig rations by dried grass of the quality here used are but small, and subject to a maximum limit of about 10–15 per cent. of the total ration. For the earlier stages of feeding probably an even lower limit should be imposed. This impression has been confirmed by subsequent experience with a better sample of dried grass." It should be noted that the dried grass used in this experiment contained about 20 per cent. of fibre and only 12 per cent. of crude protein, being thus little better in composition than good hay, but, on the other hand, it was specially prepared for the pig by grinding to meal. In the proportions used (10–17 per cent.) the grass had a laxative effect, and the rations containing it were not readily consumed.

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SOILS AND FERTILISERS.

Nitrogenous Fertilisers.

The year 1933 was one of hope for agriculturists, as the Government made it clear that steps would be taken to stop the drastic fall in prices that has threatened first arable and then live-stock farmers with ruin. The various schemes put forward by the

Ministry were already beginning to affect some groups of farmers and this showed itself in increased acreages of wheat and sugar beet. The fall in consumption of fertilisers, which had been a characteristic feature of every year since 1929, was arrested, and for the first time for five seasons there was no further drop. There was a marked increase in the consumption of sulphate of ammonia in this country, which, however, was offset by a corresponding fall in the consumption of nitrate of soda, so that the total consumption of nitrogen was unchanged. The figures for Great Britain, Ireland and the Channel Islands were (Ref. 1) :—

	1930–31.	1931–32.	1932–33.
		English tons.	
Sulphate of Ammonia	165,814	228,338	238,643
Nitrate of Soda (estimated)	45,000	33,000	20,000
		Metric tons.	
Total Pure Nitrogen in all Fertilisers	—	58,300	58,300

Perhaps the most striking change in the fertiliser industry has been on the commercial side ; there has been a marked shrinkage in imports and a notable expansion of exports : this has particularly affected nitrate of soda, superphosphate and basic slag :—

DECLINE IN IMPORTS.

	1931.	1932.	1933.
		English tons.	
Nitrate of Soda	80,964	11,139	1,949
Kainit, etc.	102,056	68,363	61,736
Superphosphate	112,085	58,700	33,532
Basic Slag	49,421	9,736	1,468

INCREASE IN EXPORTS.

	1931.	1932.	1933.
		English tons.	
Basic Slag (*a*)	13,455	17,595	30,127
Superphosphate (*a*)	10,500	13,037	20,659
(*b*)	2,816	5,772	16,060

(*a*) These figures include shipments from Great Britain and Northern Ireland to the Irish Free State. (*b*) Net export after eliminating figures for the Irish Free State.

The ease with which enormous quantities of nitrogenous fertilisers can be made from the air has added to the difficulties of the smaller gas works in the disposal of their ammoniacal liquors. In America (Ref. 2), Germany (Ref. 3) and in this country (Ref. 4) it is shown that ammonia solution can be used direct as fertiliser. The experiments were made on sewage farms where the liquid was easily applied : on most farms, however, the difficulty of getting it on the land is so great that some solid compound is indispensable. A number of these are

being tried, including among others magnesium ammonium phosphate (Ref. 5).

Cyanamide still continues to attract attention among agricultural investigators and in 1933 several useful summaries of field experiments were published in Germany (Ref. 6), the United States (Ref. 7) and England.

It was for many years supposed that nitrate is the best nitrogenous nutrient for plants and there is no doubt that in practice plants on arable land usually obtain most of their nitrogen in this form. It is, however, generally recognised that for some crops sulphate of ammonia is distinctly better than nitrate of soda and the experience is so usual that one feels it must be associated with the plant and not with the conditions of growth. W. P. Kelley (Ref. 8), the well-known Californian expert, has recently summarised the Danish experiments; these show that, of the nitrogenous fertilisers tested, nitrate of soda proved best for wheat, barley, rye, mangolds and sugar beet. On the other hand sulphate of ammonia proved best for oats and potatoes. This experience is remarkably widespread.

PHOSPHATIC FERTILISERS.

The consumption of superphosphate in Great Britain fell somewhat and that of basic slag rose but the total amount of phosphate consumed was much the same as last year. The figures carried on from the table given last year, starting with the year of maximum consumption, 1929, are as follow:—

GREAT BRITAIN AND IRELAND—PHOSPHORIC ACID CONSUMPTION, 1929–32. METRIC TONS.[1]

Year.	Ground Phosphate Bones, etc.[2]		Superphosphate.[2]		Basic Slag.[3]		Total P_2O_5.
		P_2O_5.		P_2O_5.		P_2O_5.	
1929	161,377	45,992	741,832	114,242	326,951	52,312	212,546
1932	94,762	27,007	585,319	90,139	155,388	24,862	142,008
1933	90,000(*a*)	25,000(*a*)	559,449	86,715	169,288	27,086	138,800

(*a*) Preliminary estimate.

[1] 1 metric ton=2,205·4 lb.

[2] Calendar years.

[3] Years ending 31st May. Ministry of Agriculture Committee on Basic Slag.

Russia is said to have the intention of developing the manufacture of superphosphate; the estimated figures of production given for the past six years are (Ref. 9):—

	Metric tons.
1928	182,000
1929	376,000
1930	397,000
1931	550,000
1932	900,000
1933	720,000

It is stated that much more is intended to be produced in the future and fears have been expressed that the excess may be dumped on the world market.

There is the possibility of the production of new basic slags intermediate in solubility between the old low-soluble and the old high-soluble slags. These are now being examined in fertiliser trials in various parts of England and Scotland.

Numerous analyses of the typical mineral phosphates of the United States are given in an important bulletin recently issued by K. D. Jacob and his co-workers (Ref. 10) and it should be read by chemists and others specially interested in this subject. There is also a paper by two French workers, A. Sanfourche and J. Henry (Ref. 11) on the fixation of superphosphate in the soil, suggesting that this is brought about not by calcium carbonate as used to be taught in the text books but by the soil colloids.

It has often been stated that the silica in basic slag is a great advantage, though British experiments have never shown anything that is worth paying for. Several German workers (Ref. 12) have put forward fresh claims for the silica. C. La Rotunda obtained, like others, crop increases by the use of slag, but unlike the British workers he found no increased uptake of phosphorus by the plant. There was, however, an increased uptake of silica and to this he attributed the beneficial action of the slag. H. Kappen (Ref. 13) reaches a like conclusion on altogether different grounds. He found, like others, that the calcium in slag (he used a blast furnace slag, not a basic slag) had approximately the same effect on plant growth as an equivalent amount of calcium carbonate and yet it had less power of neutralising acid soils. He concludes, therefore, that the beneficial effect must be, partly at any rate, due to the greater uptake of silica.

The Potassic Fertilisers.

New sources of potassic fertilisers are opening up and the old monopoly long enjoyed by Stassfurt, and till recently shared between Stassfurt and Alsace, may not continue indefinitely. The United States increased its output considerably, as also did Spain, and there seems little doubt that much more potash is available than had been supposed. Poland and Russia both contain great supplies, and much can be obtained also from the Dead Sea. Whether it is worth while developing all these sources simultaneously to the fullest capacity or whether an organised supply would not be better, is a question that lies outside our province ; certainly the existing supplies are adequate for present needs and it seems unlikely that fresh

supplies would lead to fresh effective demand. We need not stop to discuss threatened or possible expansion; the production during the years 1932 and 1933 reckoned in English tons of pure K_2O was[1] :—

POTASH.

	1932.	1933.
Germany	847,000	900,000
France	306,000	320,000
U.S.A.	56,000	110,000
Spain	65,000	95,000
Poland	33,000	30,000
Other countries (Palestine, Russia)	7,000	35,000

The old problem of the comparative values of sulphate and muriate of potash continues to be investigated. So far as yield is concerned both give practically the same result, but there are certain differences when it comes to the finer points of chemical composition of the crop. Two German workers, T. Remy and A. Dhein (Ref. 14), find, like many predecessors, that both gave similar yield increases and also that the chloride decreased the dry-matter content and the starch content of the potato tuber more than the sulphate (Ref. 15). Other workers found that potassic chloride increased the mealiness of the potato more than the sulphate (Ref. 16). Returning, however, to Remy and Dhein's work, they showed that potassium chloride tended to facilitate the uptake of bases by the plant while the sulphate tended to restrict it. Also the chloride helped better to protect the plant from insect damage and it reduced the loss of water from the soil as compared with the sulphate.

Plant Food Consumption.

The plant food consumption in Great Britain and Ireland was, in 1933 (in continuation of last year's table), in metric tons[2] :—

	Nitrogen.	Phosphoric acid.	Potash.
1929	49,850	212,546	61,388
1931	45,950	157,113	52,500
1932	58,300	142,000	38,650
1933	58,300	138,800	[3]

The change in proportion of nitrogen, potash and phosphate consumed in the form of artificial fertilisers, which has been so marked a feature of post-war agriculture, still continues

[1] *Fertilisers and Feeding Stuffs J.*, Vol. xix., No. 6, p. 126.
[2] Figures kindly supplied by A. N. Gray, Esq., International Superphosphate Manufacturers' Association.
[3] Figures not available at time of going to press.

in this country though the proportion of phosphate has fallen less than in France. The percentage of the different fertiliser constituents consumed (Ref. 17) have been :—

	Great Britain.			France.		
	Nitrogen.	Phosphoric Acid.	Potash.	Nitrogen.	Phosphoric Acid.	Potash.
1913 .	15·4	65·6	19·0	17	75·6	7·3
1929 .	18·0	61·5	20·5	18·4	56·3	25·3
1932 .	24·4	59·4	16·2	22·8	50·7	26·6

It still remains to be seen whether the fall in the proportion of phosphate and potash to nitrogen is merely a passing phase, or, if not, whether it is sound.

A valuable account of fertilisers in the British Empire has been published by A. N. Gray,[1] giving various particulars and statistics not readily found elsewhere.

History of Fertilisers. An interesting account of the history of fertilisers has been published by M. Lenglen ; it well repays study.[2]

THE DRILLING OF FERTILISERS.

Much work has been done on the methods of applying fertilisers. The old broadcasting method favoured in England lacks efficiency in many conditions. Australian farmers have given it up and indeed on the prairies of Western Canada it was so inefficient that it led to the view, now known to be incorrect, that fertilisers have no effect on the yield of wheat. With better methods of distribution the yields of wheat on the Canadian prairies are notably pushed up by the use of superphosphate in the drier regions and of nitrogenous fertilisers in the moister regions. Much work is being done on the subject in the United States and the general result appears to be that the fertiliser should be placed near to the seed and alongside it rather than under it or mixed with the soil in the row. For the maize crop (which in the States is grown in rows widely apart and then thinned out to a considerable spacing between each plant) the putting of the fertiliser in the row or in the hill is much better than broadcasting. Russian investigations show the advantage of putting the fertiliser direct under the cabbage, instead of spreading it on the land (p. 383). For potatoes the best position for the fertiliser seems to be in narrow bands about 2 in. each side of the seed and from seed level to 2 in below. Cereal seeds are not injured, and indeed the yield is said to be increased, when the fertiliser actually touches them, so that both in Australia and in Canada the seed and the fertiliser run down the same spout. Some of the modern large scale cereal farmers in the southern counties of England are adopting the same method. Peas and beans, however, are

[1] *Empire Journ. Expt. Agric.*, 1934, Vol. 2.
[2] M. Lenglen, *Chimie et Industrie*, Vols. 26-29, 1931-1933 (serial papers).

more sensitive and the fertiliser should not touch them (Ref. 18). The necessary implements to deliver the fertiliser in these particular ways are being made, and considerable advances in fertiliser drills may be expected in the near future; improvement was indeed needed as the old drills often failed to distribute regularly, and this objection is serious where the new concentrated fertilisers are used.

Manuring of Crops.

The development of new methods of field experiment at Rothamsted[1] has given a considerable impetus to the study of manurial requirements of crops in Great Britain, and much work is now being done in different parts of the country to find out how the various manures affect the crop.

Potatoes. The numerous experiments made at Rothamsted and Woburn, and at outside centres under Rothamsted supervision, were summarised by E. M. Crowther at a Potato Conference held at Rothamsted in February 1934 (Ref. 19). The results are collected in Tables 1 and 2, a distinction always being made between the fen soils and the others because of the great difference in their agricultural properties.

Table 1.

SIGNIFICANT RESPONSES OF POTATOES TO FERTILISERS.

Nutrient.	Soil.	Negative.	Insignificant.	Positive.
Nitrogen	Fen	–	2	11
	Others	–	3	16
	Total (32)	–	5	27
Phosphoric Acid	Fen	–	—	8
	Others	2	17	13
	Total (40)	2	17	21
Potash	Fen	–	5	9
	Others	–	14	8
	Total (36)	–	19	17
Interactions:				
N and P_2O_5		1	9	6
N and K_2O		–	19	4
P_2O_5 and K_2O		–	16	1

In 90 per cent. or more of the trials there was a definite response to sulphate of ammonia. Fenland soils, which are rich both in total and in available nitrogen, responded to sulphate of ammonia just as frequently as the mineral soils.

[1] See, for last year's developments, F. Yates, (*a*) Analysis of Replicated Field Experiments when Results are Incomplete, *Empire Jl. Expt. Agric.*, 1933, Vol. 1, pp. 129–142; (*b*) Formation of Latin squares for Field Experiments, *ibid.*, pp. 235–244.

Each of 8 fenland soils responded to superphosphate but only in 13 out of 32 trials did the mineral soils give significant responses. In two experiments superphosphate definitely reduced the yield. In three experiments on acid peat or "moss" soils in Lancashire there was no phosphate response. It is clear, then, that fenland soils stand out quite distinctly from other soils in their need for phosphate, as is, of course, well recognised in practice.

In 36 potash trials, one-half gave definite responses, with some indication that fenland soils were more responsive to potash than mineral soils.

In so far as the soils tested in these experiments were typical, they show that sulphate of ammonia is almost always effective and that superphosphate is effective on fenland soils. Superphosphate on mineral soils and potash on all soils are much less consistently successful in increasing yield. The experiments show that sulphate of ammonia and superphosphate quite often "interact positively", *i.e.*, they frequently reinforce each other's effect. Thus in 6 out of 16 trials the response to either sulphate of ammonia or superphosphate in the presence of the other manure was significantly greater than in its absence. This harmonises with the striking effects of superphosphate on fenland soils, for these are known to be rich in available nitrogen. The "interactions", or reinforcements of effects of nitrogen and potash and of potash and phosphate were much less frequent. Positive significant effects were obtained 4 times out of 23 for nitrogen and potash, and only in 17 trials for potash and phosphate.

The size of the response is shown in Table 2.

Table 2.

RESPONSES OF POTATOES TO FERTILISERS.

Response in cwt. per acre.		Decrease.		Increase.						
		20–10.	10–0.	0–10.	10–20.	20–30.	30–40.	40–50.	50–60.	Over 60.
Nitrogen . . (0·4 cwt. Nitrogen per acre = 2 cwt. sulphate of ammonia.)	Fen Soils	–	1	1	1	1	6	2	–	1
	All Soils	–	3	3	5	7	9	3	1	1
Phosphoric Acid . (0·6 cwt. P_2O_5 per acre=4–5 cwt. super.)	Fen Soils	–	–	–	1	2	2	1	2	–
	All Soils	3	9	8	7	4	5	2	2	–
Potash . . (1·0 cwt. K_2O per acre=2 cwt. sulphate of potash.)	Fen Soils	1	3	1	3	2	–	–	2	2
	All Soils	1	7	11	7	4	–	–	3	3

The responses to nitrogen were as a rule much the same whether the yields were high or low. Two cwt. of sulphate of ammonia per acre added between 1 and 2 tons of potatoes to the yield in just one-half of the experiments, and the other results are grouped round these values, some above and some below, in such a way as to make it possible to speak of a general nitrogen response at the rate of about 15 cwt. of potatoes per cwt. of sulphate of ammonia.

The responses to superphosphate were very variable and had no obvious connection with the productiveness of the soil. The yields in the various experiments ranged from 3 to 17 tons per acre, yet some of the most productive soils responded while some of the low-yielding soils did not. We still have a good deal to learn about the factors determining response to phosphate, and dressings cannot be safely cut down without clear experimental evidence.

The responses to potash, on the other hand, showed some connection, though not a close one, with yield. At most of the centres where the responses have been small the yields were over 10 tons per acre, which is well above the average for the country.

The reinforcement of effect when superphosphate supplements sulphate of ammonia or when sulphate of potash is added—the "interaction" mentioned above—is well shown on the fen soils. The results are given in Table 3.

TABLE 3.

YIELDS OF POTATOES, TONS PER ACRE. FEN SOILS.

	Used alone.	Used with Sulphate of Ammonia.	Difference (interaction).
Increase due to Superphosphate—			
Little Downham, 1932	2·96	4·40	$1{\cdot}44 \pm 0{\cdot}71$
March 1932	1·03	1·92	$0{\cdot}89 \pm 0{\cdot}24$
Increase due to Sulphate of Potash—			
Thorney, 1933 (no dung)	3·49	4·78	$1{\cdot}29 \pm 0{\cdot}52$
Thorney, 1933 (dung)	0·74	2·19	$1{\cdot}45 \pm 0{\cdot}52$

In the 1933 experiments at the outside centres (the summer being unusually dry) nitrogen had somewhat less than its usual effect, though the increases were very profitable. Potash acted well at practically all the centres, especially on the lighty peaty fens, but most of all on the medium loam at Doncaster. It was the only fertiliser effective for the early potatoes. Superphosphate acted unusually well, giving four successful responses in five trials and showing up particularly well on the heavy soil at Rothamsted.

The chemical work on the composition of potatoes has continued on the lines of the quality investigations made in

conjunction with Messrs. Lyons laboratories in 1929. Fertilisers had but little effect on the cooking quality of the potatoes; sulphate of ammonia slightly decreased, and potassic fertilisers slightly increased the quality for steaming, but neither affected the quality for frying. The effects, however, were small and nothing like as marked as the effect of soils. By no fertiliser treatment was it possible to raise the quality of the Rothamsted potatoes to the level of those grown at Woburn (Table 4).

TABLE 4.

MARKS FOR QUALITY OF STEAMED POTATOES, 1929.

Cwt. K_2O per acre.	Woburn.	Rothamsted.	Cwt. N. per acre.	Woburn.	Rothamsted.
0	32·6	28·5	0	34·4	29·2
0·5	33·6	29·5	0·3	33·3	29·3
1·0	34·5	29·6	0·6	32·9	29·1

The practical conclusion is that the quality is determined by soil and season, and yield by the fertiliser dressing. Quality is not likely to be affected one way or the other by a good scheme of complete manuring, and so the grower can aim at producing heavy crops without fear that the quality will suffer. This same result was obtained for barley.

Chemical analysis shows consistent changes in composition produced by fertilisers which, however, are small and nothing like so marked as those obtained on the same soil in different seasons. The amount of dry matter in the fresh tubers was but slightly affected by sulphate of potash but somewhat reduced by potassic fertilisers containing chlorine, *e.g.*, muriate of potash and still more by 30 per cent. potash salts (Table 5).

Sulphate of ammonia consistently increased the nitrogen content of the dry tuber. Superphosphate reduced the nitrogen content of the dry tuber in those years in which it greatly increased the yield. Potash had no effect on the nitrogen content of the dry tuber.

Although the potato is essentially a carbohydrate food, it is an efficient crop for converting inorganic nitrogen—sulphate of ammonia—into vegetable protein. The recoveries in the potato tuber of the nitrogen added as sulphate of ammonia in the Rothamsted experiments of 1929 to 1932 were 21, 43, 29 and 36 per cent., respectively; in addition, 20 per cent. may be recovered in the haulm.

Sugar Beet. The year 1933 was important in the history of sugar beet experiments as it marked the beginning of a close co-operation between the sugar beet factories and the experimental stations at Rothamsted, the National Institute of Agricultural Botany, the Oxford Institute of Agricultural

Engineering, the Norfolk Agricultural Station, and other centres. A scheme of experiments was started which will be modified as experience suggests, but which may confidently be expected to yield results of very great value to growers.

The first year's fertiliser results were discussed at a Conference between the Rothamsted and the factory staffs; as the result a satisfactory experimental programme was drawn up and is now being carried out.

The general purpose is to test the effects of fertilisers at a number of centres, and to make chemical examinations of the soil as described later. Reference to the tables in the full Report shows that the response of beet to fertilisers is less definite than that of potatoes or mangolds, and we do not yet know how to draw up proper recipes for the manuring of sugar beet. The crop, of course, requires manuring, but the ordinary methods seem often to be less effective than for other crops.

Part of the explanation may lie in the fact that the sugar beet farms on which the experiments were made were above the average in productiveness. The average of yields on these plots was 11·5 tons per acre, while the average for the country was only 9·0 tons. It is possible that more definite responses would have been obtained on farms below the average in productiveness. This, however, is not the whole explanation.

The experiments at Rothamsted indicate that the subsoil plays an important part in the feeding of the sugar beet. In the absence of dung, potassic and phosphatic fertilisers increased the yield of roots and the percentage of sugar to a greater extent when ploughed in so as to get well down into the soil than when drilled in the usual way. On the light soil at Woburn the result was reversed. This experiment is being repeated; the yields were too low and the standard errors too high for complete satisfaction.

Sugar beet differs from all other crops in the very high concentration of its root sap, and this cannot fail to modify in some way or other the translocation of sugar from the leaf. A physiological study of the growing crop is needed before the manurial problems can be fully solved.

The spacing of the rows is particularly important. So far as the experiments have gone the closer the rows the better. At Rothamsted, rows 10 in. apart gave 37 per cent. higher yield of roots than rows 20 in. apart; the sugar-content was higher and the yield of sugar per acre was raised no less than 41 per cent. The yield of tops was higher also. This increase of sugar-content of the root appeared only when the rows were less than 15 in. apart; between the 20-in. and the 15-in. spacing there was no difference.

At Woburn similar results were obtained: rows 10 in. apart gave 21 per cent. higher yield of roots and 24 per cent. more sugar per acre than rows 20 in. apart.

On the other hand, as shown last year, nothing was gained by giving more cultivation than is needed to keep down weeds.

There is clearly a great deal to be learned about the growth of the sugar beet crop. In our experiments the yields have varied from 6 to 16 tons per acre. The average crop over the country is too low to enable the industry to be self-supporting, and it is unreasonable to expect a subsidy to continue unless the fullest efforts are made to raise yields.

Mangolds. An examination of the yields of mangolds on Barnfield for the years 1876 to 1930 has been completed by R. J. Kalamkar. The new facts brought out are that the deterioration of yield usually observed where one crop is grown continuously has not been pronounced on the plots receiving farmyard manure or complete artificials including nitrate of soda, but it becomes more marked when either nitrogen, or potash and phosphate, are omitted. Slow changes in yield other than deterioration are unimportant except on the dunged plots. The annual variance is increased by nitrogenous manuring but decreased by potassic fertiliser and also by rape cake or dung. Variations in rainfall do not account for the variations in yield due to seasonal causes, though rainfall in excess of the average appears to be somewhat harmful when it comes in Spring (mid-March to end of May) and beneficial when it comes in June and July.

Marrow-stem Kale. This is proving one of the most valuable fodder crops on the farm. In our numerous experiments yields of 25 tons or more per acre are frequently obtained on our poor heavy land. The crop responds remarkably well to nitrogenous manuring, and is one of the best for converting fertiliser nitrogen into valuable animal food.

The residual effect of the farmyard manure applied to the 1932 kale crop at Woburn was studied by following it with barley in 1933, and comparing the yield with that given by sulphate of ammonia. On plots that had 15 tons per acre of farmyard manure in 1932 there was an increase of 12·2 cwt. of green matter over the plots receiving no dung; while 0·2 cwt. of nitrogen applied as sulphate of ammonia in 1933 gave an increase of 20·7 cwt. per acre. The residual effect of the farmyard manure was, therefore, approximately that of 0·118 cwt. nitrogen per acre, or 0·6 cwt. sulphate of ammonia. No residual effect of sulphate of ammonia applied in 1932 could be detected.

Lucerne. The demand for cultures of the nodule organism still continues to be satisfactory, and we are informed by Messrs.

Allen and Hanbury that enough were sold last year to treat seed for 4,200 acres.

Meantime, H. G. Thornton is continuing the study of the relations between the nodule bacteria and the plant. He finds that the infection of the host legume increases very greatly at the time when the true leaves open. At that stage the root hairs exude something which apparently causes the nodule bacteria in the soil to multiply and, in turn, to produce something which causes the root hairs to curl; and at the bend thus made the bacteria enter. Dr. Thornton has now isolated from the bacterial products a gum which causes the root hairs to curl and also to grow, so that it is either itself a growth-stimulating substance or it is associated with one. Its action, however, is neutralised by a small quantity of nitrate, in the presence of which the root hairs remain straight so that the bacteria cannot enter—hence the well-known effect of nitrate in reducing the number of nodules or inhibiting their formation. This neutralising effect, however, is overcome by the addition of a little sugar, suggesting that the carbon/nitrogen ratio, known to be important in other aspects of micro-organic life, is important here also.

Clover. Cultures of the nodule organism have been prepared which in preliminary experiments made in association with Professor Stapledon greatly improved the "take" of clover on newly-sown upland grassland. Should any extensive re-sowing seem likely to occur steps would need to be taken to ensure an adequate supply of the cultures.

Cereals. An important series of experiments conducted at the Waite Institute, South Australia, has recently been summarised by Richardson and Gurney (Ref. 20).

When wheat was grown in rotation with (1) bare-fallow, (2) wheat, (3) barley, (4) oats, or (5) peas, without fertiliser or with 2 cwt. superphosphate and 1 cwt. sulphate of ammonia per acre, the highest yields were obtained after bare-fallow or after peas. Wheat after oats gave significantly higher returns than wheat after barley or wheat after wheat. Superphosphate gave its greatest effect with wheat after bare-fallow, the mean yield being increased by 19·5 bushels per acre for the three years. After peas the response to superphosphate was significantly higher than after cereals, but less than after fallow.

A supplementary dressing of 1 cwt. of sulphate of ammonia per acre gave no significant increase with wheat after bare-fallow, but gave a substantial response after wheat, barley or oats, ranging from 6·5 to 7·7 bushels per acre. Wheat grown after peas still needed sulphate of ammonia, though the previous pea crop presumably added supplies of organic nitrogen to

the soil, and a mean increase of 6·1 bushels per acre was obtained.

Barley gave a marked response to sulphate of ammonia for all dressings from 14 lb. to 425 lb. per acre. A quantitative relation (Mitscherlich's law) was observed to hold between the amount of fertiliser applied and the yield of barley. When adequate quantities of soluble phosphate are applied nitrogen becomes a limiting factor, and increments in yield of total produce and of grain decrease with each successive dressing of sulphate of ammonia, in accordance with the law of diminishing returns. The percentage of nitrogen in the grain was practically unaltered for dressings ranging from nil to 56 lb. sulphate of ammonia. Dressings of 1 cwt. per acre slightly increased the percentage of nitrogen, but with heavier dressings a material increase in nitrogen-content was observed, and the quality of the grain for malting purposes was reduced. Census studies on barley (Ref. 21) showed that the mean effect of nitrogenous fertilisers on barley was to increase the number of ear-bearing tillers per plant.

Dr. F. T. Shutt has now retired from the post that he has long filled with great distinction of Dominion Chemist at Ottawa, and he has summarised the results of many years of experiment on the quality and composition of wheat (Ref. 21).

Experiments at Rothamsted indicate that sulphate of ammonia applied in autumn does not reduce the winter-killing of wheat.

It is well known that potassic fertilisers improve the water supply to plants and some interesting measurements by Schmalfuss (Ref. 22) show that oats grown with deficient supplies of potash transpired 25 per cent. more water per unit of dry matter formed than oats adequately supplied with potash. On the other hand, as other observers have found (p. 216), potassic fertilisers have no effect on the moisture content of the soil.

Grassland. Two groups of investigation are being made on grassland at a large number of centres :—

1. The effect of manures on the yield and composition of the herbage.

2. The influence of management (usually grazing) on the type of herbage.

The manuring of grassland alters not only the yield and consumption of each of the individual species of plants, but also the balance of competition between one plant and another, and, therefore, changes the entire flora. Investigations have been made with phosphatic fertilisers which, broadly speaking, tend to give a largely leguminous herbage ; and with nitrogenous fertilisers, which tend to make the grasses dominant.

The work on phosphatic fertilisers has been done by the Rothamsted staff under the ægis of the Basic Slag Committee of the Ministry of Agriculture. The outstanding result is the general superiority of superphosphate and of high-soluble slag over low-soluble slag, and, on non-acid soils, over ground mineral phosphate. On an average the high-soluble slag has been about three times as effective in supplying phosphate to the plant as the low-soluble slag containing equal amounts of phosphate, while the mineral phosphate has been, on certain acid soils, as good as the high-soluble slag and, on non-acid soils, about as poor as low-soluble slag. The percentage recovery of phosphoric acid over the three or four years is given in Table 5.

TABLE 5.

PERCENTAGE RECOVERY OF PHOSPHORIC ACID IN 3 OR 4 YEARS IN GRASSLAND EXPERIMENTS.

Season.	Treatment of grass.	Centre.	Geological origin of soil.	Soil reaction (*p* H).	Low soluble slag.	Gafsa mineral phosphate	High soluble slag.	Super-phosphate.
NEUTRAL OR CALCAREOUS SOILS—								
1930–33	Hay	Braintree, Essex	Calcareous boulder clay	7·8, alkaline	3	3	17	17
1930–33	Hay	Badminton, Glos.	Oolite	7·2, neutral	2	4	13	16
1931–33	Repeatedly mown, ungrazed	Much Hadham, Herts.	Calcareous boulder clay	7·1, neutral	8	8	34	30
1931–33	Grazed, mown once annually	Much Hadham, Herts.	Calcareous boulder clay	7·1, neutral	6	8	26	30
				Mean	5	6	22	23
ACID SOILS—								
1930–33	Hay	Chesterfield, Derby	Lower coal measures shales	5·1, very acid	6	13	13	15
1930–33	Hay	Lydbury, Salop	Wenlock shales	5·2, very acid	10	19	14	18
1930–33	Hay	Cockle Park, Northumberland	Boulder clay	4·9, very acid	3	10	7	8
1931–33	Hay	Northallerton, Yorks.	Boulder clay on Keuper marl	5·2, very acid	5	16	18	21
1930–33	Repeatedly mown, ungrazed	Dartington Hall, Devon	Devonian shales	5·2, very acid	6	29	31	32
				Mean	6	17	17	1[illegible]

This superiority of the soluble phosphates shows itself not only in increased yield and larger proportion of good fodder plants, but also in the higher content of phosphorus in the herbage, whereby its feeding value per ton is almost certainly enhanced.

The experiments are being continued to ascertain the value of slags of intermediate solubility such as may possibily be available in the near future.

The striking effect of phosphate on hill pastures in Wales has been described by Davis and Chippindale (Ref. 23).

Organic Manures ; Soil Organic Matter.

It is common knowledge that organic matter plays an important part in soil tilth ; text books and lecturers alike deal at length with humus as a constituent of soils, justifying themselves on the score that soils well supplied with organic matter are commonly fertile, and that in any system of permanent rotation it is customary to return organic matter to the land by ploughing in the residues of leys, leaves of root crops, stubbles, farmyard manure and other substances. Although the advantages of organic matter in the soil and as manure have been so often praised that they are usually taken for granted, it must be admitted that the direct experimental evidence is only slight. Usually, in long continued experiments, the comparison of farmyard manure with artificials is weakened by the fact that the farmyard manure plot received far more nitrogen and potash in the manure than the plots receiving artificial fertilisers only. Further, the experiment is generally made with cereals which do not respond very clearly to organic matter. Various reviews of these older experiments (Ref. 24) indicate that the superiority of the farmyard manure plot can be fully explained by the amounts of nitrogen, phosphoric acid and potash supplied, and there is nothing left over for any mysterious effect of organic matter. In several of the experiments,and in all the Rothamsted and Woburn experiments, the farmyard manure steadies the yield as compared with the artificial manures ; the variation from season to season is less and the deterioration that always accompanies continuous cropping is reduced considerably. It is possible that these effects would also be given by the artificials if they were applied in quantities equivalent to the plant foods in the organic manure. But there does seem to be the something more. One set of long continued experiments brings out an important property of the organic matter. On the Rothamsted mangold plots part of the ground has had no farmyard manure or any other organic manure since 1843, while part receives farmyard manure

every year. During the recent dry seasons the plants on this latter area started much earlier and grew much better in the early part of the season than those without organic matter, partly at any rate due to the better tilth and the larger amount of soil moisture retained where organic matter had been given. The classical instance of the unexplained effects of farmyard manure, however, is on Hoos field at Rothamsted where a plot that received farmyard manure from 1852 to 1871, but nothing since, still gives nearly double the crop of barley obtained on the adjoining plot that has been similarly treated since 1871, but had received no farmyard manure during the preceding 20 years. At the time of writing (mid-July 1934) the barley on this old manured plot is strikingly better than that on the old unmanured land, suggesting some benefit from the farmyard manure given more than 60 years ago. We have not yet succeeded in accounting satisfactorily for this result. Similar long-continued differences are recorded at Woburn, though here there is some uncertainty owing to irregularities of the land.

Some curious effects of farmyard manure are reported from Nigeria. Hartley and Greenwood (Ref. 25) show that appreciable increases in guinea corn (*Sorghum vulgare*) are obtainable from the application of only 1 ton of farmyard manure per acre. Thus on a poor light soil a dressing of 2,000 lb. farmyard manure gave an increase of 10 cwt. per acre over the unmanured yield of 364 lb. per acre; a 2-ton dressing gave higher yields, but 3 and 4 tons proved no better. The effect could not be attributed to the nitrogen or potash in the manure, since equivalent quantities of artificial fertilisers failed to give as good a return. No adequate explanation is yet forthcoming.

Part of the difficulty of assessing the value of organic matter as fertiliser lies in the fact that fallowing, which usually forms the basis of comparison where organic matter is supplied by the ploughing in of crop residues, is itself a very good preparation for a cereal crop.

Where farmyard manure is used there may be considerable difference in effect according as it is supplied in autumn or in spring. There is some evidence that in the drier parts of England autumn applications are probably best, and in the wetter parts spring applications, but the evidence is not beyond reproach. In Danish experiments (Ref. 26) autumn applications were only about half as effective as spring dressings for a spring-sown crop, though the residual effects on later crops were much the same. Experiments of this kind are complicated by the fact that the manure used is often made or stored in special small heaps where the conditions may be entirely different from those of a large heap, as used in practice.

German experience of this organic matter problem is very similar to English experience and a summary by P. Ehrenberg (Ref. 27) might easily have been written in this country. The difficulties of estimating the value of the manure produced under different types of farming, the uncertainties of green manuring through the risk of loss by leaching and the possibility of working up more organic matter into manure by composting, are all problems and points of view familiar to English workers.

From time to time it is suggested that animal urine contains some substance that specially promotes the growth of plants, but Lemmermann and Behrens failed to obtain evidence that this is so (Ref. 28).

However, while the experimental evidence in favour of the value of organic matter is not clear there is certainly no evidence against it; and the fairest summary of the position is that the field experiments hitherto made have not been well designed to test the question, so that their evidence is not clear. A new series of field experiments at Rothamsted, for which Lord Iveagh is generously making financial provision, is designed to avoid the weaknesses of the old experiments and to give a clearer answer.

In the meantime it is safest to assume the desirability of organic matter in the soil and to make provision for it either by farmyard manure, leys, green manures, or in other ways.

The Use of Peat and Coal Products as Fertiliser.

The apparent similarity between the black, sticky, well-rotted material in peat and the black, sticky material in farmyard manure and in rich black soils, has naturally led to a considerable amount of experimental work to see if the peat can be used as manure. Much of this has been done in Germany, where vast deposits of peat occur and where the important and well-known experiment station at Bremen was set up to deal with the problems of moor culture and peat utilisation. The Director, B. Tacke, has recently summarised some of his results (Ref. 29): he finds that direct application of raw peat to the land is rarely advantageous; it is better used as litter and worked into the soil in that way. As compared with straw for litter, the Danish experiments (Ref. 30) show that the straw rots down more easily than peat, but that, on the other hand, peat absorbs more ammonia than straw and also allows it to nitrify more easily; this accords with English experience. American workers (Ref. 31) find that straw, rotted by animal manure in the usual way, or by the Adco process, gave better results for tomatoes in glasshouses than peat (from "sawgrass")

and a compost; it is, however, claimed that peat composted with farmyard manure and mineral phosphate for a year makes a useful fertiliser (Ref. 32).

The lack of organic manure, and the persistent demand for it, have led to a rapid increase in the consumption of peat especially for lawns and glasshouses. A description and classification of the different varieties of peat available in the United States has been published by A. P. Dachnowski-Stokes, who has long been in charge of peat investigations in that country (Ref. 33). He shows that in dry regions the light-coloured fibrous moss, sedge or reed peats are useful for improving soil structure and for slowly supplying plant food, while in cooler, moister conditions the darker and more decomposed peats are better.

Brown coal and coal waste can be converted by chemical means into black "humic" substances looking very much like the black material that can be extracted from fertile soils. Some of these have been highly praised as fertilisers in Germany, but the evidence is distinctly slender; Lemmermann's results (Ref. 34) were unfavourable. In the careful tests made at Rothamsted of one of the best of the coal products, no good fertiliser effect was obtained, and the only apparent use of the product would be as a base or mixing agent in compound fertilisers for general horticulture or glasshouse crops (Ref. 35).

Manure from Straw and Vegetable Waste.

The well-known Adco process worked out at Rothamsted and then handed over to the Adco Syndicate for development; continues to prove useful in many parts of the world (see pp. 362 and 382). A similar process has been developed at Indore, but using sewage and other household wastes as the activating material; it promises to be of great value not only in India, but in other densely-populated agricultural countries (Ref. 36).

The Organic Matter Problem in New Countries and in the Tropics.

In new countries where agriculture is highly specialised, rotations that supply organic matter to the soil have not yet been worked out, and little or no farmyard manure is made; the system is usually an alternation of fallow with one or more cash crops: cereals in temperate climates, oil, fibre or alkaloid crops in tropical climates. In consequence there has been a considerable loss of organic matter from many of the soils in the new countries and little or nothing is done to replace it. On the Canadian prairies the loss of organic matter has intensified the dust-storm trouble and led to "soil drifting"; the

soil of a field may be blowing away, carrying with it a young wheat crop. This problem of soil erosion is very familiar to agriculturists in hot countries where cultivation has been so well done as to destroy the organic matter.

Another difficulty is that the soils lose some of their power of holding moisture in dry conditions, and of allowing it to soak away in wet conditions. In Queensland some of the cotton soils have lost so much organic matter after six or eight years of cultivation that they are now markedly less permeable to water and in consequence less productive than before. Gueltzer (Ref. 37), at the Experimental Station of Ac - Kavaksk, shows that on the irrigated grey soils of Central Asia a decrease in the percentage of organic carbon in the soil leads to a falling off of stability of the soil aggregates towards water, while an increased carbon-content brought about by the growth of lucerne increased the stability of the soil aggregates.

It is not at present certain whether these particular advantages of binding the soil and of allowing excess water to drain away are due more to the rotted black product called humus, to the fine roots of previous crops, or to some other decomposition product; from the practical point of view, however, the important point is somehow to return the plant organic matter to the soil. In tropical regions the problem of maintaining supplies of soil organic matter differs according as one is dealing with the dry tropics or the wet tropics. The practical difficulty is that in most of these new countries agriculture is simply an exploitation of the soil reserves and not a permanent industry of using and replacing them, as happens in this country and in Western Europe; and in consequence a scheme which, while ensuring permanence, may bring no benefit in the next few years, is not regarded with much interest by the average planter. Under native conditions the problem does not arise because the land, after a period in cultivation, is usually left to run wild, when the native vegetation sooner or later restores the organic matter to the soil. Under European control this system is frequently not applicable, especially where a costly irrigation system has been installed.

The subject was discussed by E. M. Crowther at the Empire Cotton Growing Corporation Conference in July 1934 (Ref. 38). He points out that cotton cultivation is particularly conducive to loss of organic matter from the soil: it involves much tillage in hot, moist conditions very favourable to oxidation of soil organic matter. In the older countries the situation is met by heavy dressings of artificial fertilisers, as in the cotton areas of the United States, or by ploughing in residues of large crops such as berseem, as in Egypt. In the newer countries where cotton has recently been introduced neither method is as yet

adopted, and the stocks of soil organic matter, which even at the outset were not large, are rapidly being exhausted.

Several methods are available for increasing the supplies. The rotting down of plant residues by the Adco or Indore process (p. 192) provides compost, as also would the use of green manures as studied in Nigeria and elsewhere. In the Gezira much of the land is left for two years without crop (and without water); during this period there is some growth of native vegetation which is grazed by the animals and so returns organic matter to the land. In the Queensland dairying areas alternation of cotton and long grass leys seems a possibility. Whatever method is adopted the return of organic matter to the soil seems to be necessary if the cultivation of cotton is to be a permanent activity of the agricultural population.

The problem is solved in the old settled countries by the adoption of suitable rotations and no doubt this will turn out to be the best method for cotton. Already some information is being accumulated as to the relative advantages of one crop over another as preparation for cotton: at Barberton (N. Transvaal) for example, Heath finds that maize and beans are both better than fallow, and he attributes this to the absorption and penetration of water through the channels opened by the plant roots. In Rhodesia maize is found to yield better after cotton than after other crops—no reason is yet assigned for this. Probably part of the effect is on the water supply for the next crop; Parnell states that soybean almost exhausted the soil moisture at Barberton to a depth of 4 ft., which, of course, would have a bad effect on the following crop. The subject is undoubtedly of great importance in the newly-developed countries, and Dr. Crowther's suggested scheme of experiment, described in his paper, is well worth consideration.

Substances Required by Plants in Small Quantities only.

The standard foods of plants, nitrogen, potash and phosphoric acid, lime and others, are now known to be insufficient to keep the plant in full health and vigour. Various other elements are needed, though only in small amounts, but if they are lacking the plants suffer.

This subject is being studied at Rothamsted, at the Waite Institute, Australia, and elsewhere. Its present position is summarised in a recent publication of the Imperial Bureau of Soil Science (Ref. 39). The symptoms of the various deficiency diseases are described and also the present treatments. It is not usually possible to detect the deficiency by chemical analysis of the soil, since the "deficient" element is often present in considerable quantity, but in a form unavailable to plants.

The diseased condition is, however, preventable or curable by treating the soil with compounds of a specific element, and there are thus strong grounds for believing that it is caused by the inability of affected plants to obtain an adequate supply of the element from the untreated soil. A symptom of nearly all the so-called deficiency diseases is a leaf chlorosis (blanching) which assumes different forms according to the nature of the deficient element. One of the best-known of these diseases is "grey speck", very commonly found on oats when grown on calcareous or otherwise alkaline soils. The cause of grey speck has been traced to a deficiency of available manganese in the soil. Most soils contain sufficient manganese for plant requirements, but under alkaline conditions or when the manganese is in a highly oxidised form, it is insoluble and unavailable to plants. Grey speck can be cured by applications of soluble manganese salts, or simply by making the soil acid or introducing reducing substances (organic manures), both of which treatments increase the availability of the naturally occurring soil manganese.

Other chlorotic conditions on a great variety of trees and crops growing on calcareous or peat soils have been traced to iron deficiency. Here again the cause of the trouble is unavailability of soil iron, which plants cannot absorb from alkaline solutions nor when it is in the oxidised ferric state. Like grey speck, iron chlorosis on calcareous soils can be cured by applications of physiologically acid fertilisers such as sulphate of ammonia or of organic manures. On peaty soils, the unavailability of iron is caused by its being locked up in the organic matter ; it can be released, and iron chlorosis cured, by stimulating the oxidation of the peat by applications of lime or basic slag.

Both iron and magnesium are required for the formation of chlorophyll, and similar chloroses due to magnesium deficiency have been observed, one of the most carefully studied being the "sand drown" of tobacco.

Magnesium-deficiency diseases seem to be due to a genuine deficiency rather than to unavailability, and they occur usually on sandy soils from which the magnesium originally present has been leached out.

Instances have also been observed of diseases apparently caused by deficiencies of copper (*e.g.*, "yellow tip" of cereals and beets, and exanthema of citrus), zinc (*e.g.*, pecan rosette) and sulphur ("tea yellows"), but the parts played by these elements in plant nutrition is still obscure. Another puzzling condition is that due to boron deficiency. Boron is toxic to plants in any but the smallest amounts, but if it is lacking entirely many crops do not make healthy growth. Legumes do

not produce nodules, beets develop heart-rot, and tomatoes, tobacco and sugar cane also suffer in different ways in the absence of boron. The whole question of soil deficiencies is still very vague, owing to our limited knowledge of the nature of nutrient availability, and in this Technical Communication the Bureau has produced a collection and statement of the known facts, rather than a discussion of their meaning.

Soil Cultivation.

Work on soil cultivation continues in several countries and though there is little to report this year certain points are beginning to emerge fairly clearly. Two general rules seem to hold :—

1. A good seed bed must be prepared, and experiments can usefully be undertaken to ascertain what implements and processes do this most rapidly, most cheaply and most efficiently.
2. Weeds must be kept down, and experiments are needed to ascertain the conditions under which this is best done by cultivation or by spraying with some chemical substance.

In regard to other cultivations, however, it is impossible to lay down any rules. Deep cultivation is especially difficult to generalise about ; in many cases it has not proved at all helpful. Its most striking failures are in dry, hot countries where there is no irrigation : in these conditions deep cultivation seems ineffective if not actually harmful. But even in moister conditions subsoiling is not invariably effective and trial should always be made to find out if it is worth doing. In the Reports of 1933 a number of the cultivation treatments of wheat seemed to be without effect on the yield. These experiments must obviously be continued for several years before definite conclusions can be drawn.

Cultivation of Soil by Explosives. For many years past explosives have been used for breaking up hard pans, but recently they have been used by Piédallu (Ref. 40) in North Africa for pulverising the rock and converting it into a soil capable of bearing vines and fruit trees. The explosive used is a war residue and consists of a variable mixture of trinitrophenol (melinite), trinitrotoluene (tolite), mono- or di-nitro naphthalene and nitrocresol. Chlorates are avoided as being poisonous to plants. These nitro-explosives are as powerful as dynamite and safer to handle and they leave as residues in the soil only carbon and nitrogen compounds which are not only harmless but may even be beneficial. Holes are bored about 3 ft. deep into the rocky surface of Algeria, charges are inserted and fired. The rock is broken and much is pulverised. Large stones can be taken out for building and other purposes. The

pulverised material is levelled, and manured with sheep dung and a complete mixture of artificials. The rain, when it comes, is torrential, but instead of running off as usual and washing away any beginning of a soil layer it can now soak in and remain stored up for the plants. Potatoes, vines and fruit trees are grown with great success. M. Piédallu states that many thousands of trees have been planted and are growing rapidly, and that parks, gardens and vineyards are thriving, where, but a little while ago, there was nothing but a hot and stony waste.

The Heating of the Soil.

For agricultural purposes the heating of the soil must be left to Nature, though something can be done to help by drainage and by proper ridging. But for market garden purposes and especially for the culture of early vegetables, artificial processes can advantageously be used. These have recently been discussed by Jean Bordas (Ref. 41), the distinguished director of agricultural experiments in Avignon, France, where the subject is of great importance. He deals first with frames and glasshouses, and shows how many of them are faulty in design. Raymond of Antibes has made numerous experiments on this subject to ascertain the most favourable slope of the frame or of the roof of the house to ensure maximum warming: the details are given by Dr. Bordas. The soil also must be sufficiently moistened (preferably by the Avignon sub-irrigation method) to allow the maximum absorption of the heat units. A second method, which is now forming the subject of much experiment in France, is the use of fermenting composts made either from horse manure or from straw or other residues rotted artificially. The basis of these artificial processes is the Rothamsted work on the rotting of straw which showed that the speed of decomposition depends on the amount of food available for the micro-organisms. Like plants, they require supplies of nitrogen, phosphate and other minerals, air, water and freedom from acidity, which is ensured by the presence of calcium carbonate. These substances are not usually present in sufficient quantity to ensure a speedy breakdown of the straw and if they are added in the right amount the process becomes very rapid, much heat is engendered and a good formation of black, sticky humus results. The proper formula for various substances has been worked out by the Adco Syndicate in England who are exploiting the process commercially. In France formulae have also been worked out and the resulting heat, instead of being lost, as often in this country,

is used for the cultivation of early vegetables, mushrooms, or other profitable crops.

For glasshouse work electrical heating can be used: the process is described by W. F. Bewley (Ref. 42).

Soil Moisture.

Where the Moisture Comes From. Rain is, of course, the chief source of soil moisture but it is probably not the only one, especially in dry regions. Chaptal (Ref. 43) shows that in hot climates, at any rate, soil absorbs a good deal of moisture from the air even when the atmosphere is below saturation. As the soil temperature rises this hygroscopic moisture becomes capillary moisture which is available for plants. He proved this in an interesting and ingenious experiment. Ten cubic metres (13 cubic yards) of limestone pebbles were put into a concrete tank, the sides and top of which were perforated to allow access of air; there was also a pipe at the bottom by which the condensed water could flow out. During the hot season up to 2·5 litres (4½ pints) of water was collected daily; during the whole season no less than 88 litres (19½ gall.) was obtained. The process was not a simple condensation of water vapour from the air for it occurred when the limestone was warmer than the surrounding air; it appeared to be hygroscopic absorption. The author states that capillary rise of water from the subsoil, and distillation from the subsoil, while possible sources of water to the plant, are only rarely of importance.

How the Water is held in the Soil. This important problem has recently been discussed by R. K. Schofield in the light of the most recent work on the subject (Ref. 44). He shows that much of the soil water appears to be held by the clay between the cleavage planes of the clay minerals, and also by the soil organic matter in close association with its lattice structure. As the moisture-content falls the permeability of the soil to water falls rapidly so that water can no longer move in the soil; this is the chief cause of wilting. At these lower contents of soil moisture the effect of the clay is strongly brought out; the moisture-content at 50 per cent. humidity is connected with its base exchange properties, a cluster of water molecules being held rather firmly to the active "spots" on the clay particles where base exchange takes place. This base exchange capacity and the fineness of subdivision of the soil largely influence the permeability of the compact masses in the soil. The water in these masses does not drain away, but can be removed by suction of plants on neighbouring drier soil, or by the neighbouring drier soil itself, or, of course, by direct evaporation.

Drainage.

Unfortunately only little experimental work on drainage has been done in this country, but a considerable number of investigations have been made on the Continent.

The design and management of experimental drainage fields have been discussed by Fauser (Ref. 45) and Hallakorpi (Ref. 46). Experimental fields are at present in existence in Germany (Fauser, Ref. 47, Rothe, Ref. 48), in Czechoslovakia (Janota, Ref. 49), Denmark (Thøgersen, Ref. 50), Finland (Keso, Ref. 51), Russia (Rozov, Ref. 52), and elsewhere. Most of them are still too recent to allow of any definite conclusions being drawn from them. The data from the Czechoslovakian fields, some of which are now nearly 10 years old, are the most extensive at present available. They show that the relative efficiency of different drainage systems on the same land varies greatly from year to year according to weather and other conditions, and hence that drainage experiments must be carried on for a number of years before reliable results can be obtained. In general it was found that in heavy soils close shallow drainage tended to give the best results in wet years and wider deep drainage in dry years. Even in very dry years deep drainage showed substantial increases in yield over undrained land—a fact which has frequently been confirmed by practical experience elsewhere.

Mole and Tile Drainage. The relative merits of mole and tile drainage have been the subject of discussion on the Continent during the past few years, but it cannot be said that the question has yet been decided satisfactorily. On the one hand, tile drainage systems normally last much longer and, probably, lead to a greater improvement in the land, but on the other, mole drainage is much cheaper. There are, unfortunately, very few reliable statistics on which a comparison can be based. This is particularly the case with mole drainage, although Nicholson (Ref. 53) has made a start by his investigations on the durability of mole drains. The most widely held opinion among Continental experts is that tile drainage is to be preferred except in very heavy soils. For most British farmers the question is rather an academic one owing to the difficulty of obtaining sufficient capital for tile drainage. There is no doubt that in Germany and several other countries the preference shown for tile drainage is partly due to the fact that it is much more suitable for unemployment relief works than is mole drainage.

Several methods of mechanical mole-tile drainage are now on the market, but the high cost of the necessary machinery has so far prevented them from having much success except under specially suitable conditions, as in the reclamation of the Dutch

polders (Ref. 54). Janert (Ref. 55) has, however, produced a cheap and simple pipe-laying mole plough which is at present being tried out on an experimental field at Leipzig, and which promises to be more successful.

The possibility of combined mole and tile drainage, consisting of a few widely-spaced tile drains intersected obliquely by shallower, more closely-laid mole drains, has also been discussed (Ref. 56). It may prove to be more efficient on some soils than either type of drainage alone.

Some interesting comments on drainage are contained in the Economic Survey of Agriculture in the Eastern Counties in 1932 issued by the University of Cambridge Depart. of Agriculture (Ref. 57). It had already been shown (Ref. 58) that some 14 per cent. of the whole area needs draining, but owing to economic factors only 5 per cent. had been drained during the preceding five years. The problem was particularly acute on the clays, where some 26 per cent. of the land was reported to be badly in need of drainage. If this is so in the Eastern Counties the position would appear to be considerably worse in the Midlands and the West. In these Eastern Counties, however, a number of the farms have been mole drained during the past ten years, and a report is given on these and on other farms where the method has been practised.

The average life of the mole drain is about 13 years, the ordinary range being 8 to 19 years. There are, of course, wider ranges: some mole drains in heavy pasture land are said to have worked well for 50 years, while in one case they lasted only two years; here, however, the soil was unsuitable. Generally the drains last longer in pasture than in arable land; they are liable to damage by rats, rabbits, and moles, also by the passage over them of heavy machinery and during very dry weather in hot summers. Their life is shortened if the fall is insufficient, but the most common cause of failure is silting up by any loose sand or gravel that may occur in streaks or patches in the clay.

Most of the farmers agreed that at the time of mole draining the surface must be dry enough to carry the engines and the subsoil moist enough to form a good drain. Most preferred to drain in autumn so that the "moles" might settle properly before the droughts of summer damaged them; but some preferred spring drainage done on a cultivated fallow. The moles ranged from 2 to 6 in. in diameter; a 3-in. mole was used on about three-fifths of the farms, the depth varied from 12 to 30 in., the most usual being 20 to 24 in. The distance between the drains varied from 4 to 30 ft., the commonest being 12 ft. The length of the drains varied from 100 to 500 yds., but it was stated that the longer they are the closer they should be together.

It seems evident that a great deal has yet to be learned about the best depth and distance apart of the drains.

The moles discharged into tiled mains, bushes usually being placed above the main. Commonly these main drains were dug first so that the water from the mole drains could run straight into them ; otherwise if wet weather should supervene before the mains were finished the moles would be left full of water and would be ruined.

The Theory of Soil Drainage. The simplest theories of soil drainage assume that the soil is perfectly homogeneous, and that the rainwater falling on it percolates vertically downwards till it reaches the ground-water level. Then, when the ground-water has risen above the drain level, it starts flowing into the drain at a rate which can be calculated according to the laws of hydrodynamics. Rothe (Ref. 59), using this method of approach, and making certain simplifying assumptions, obtained the formula—

$$h=\frac{E}{2}\sqrt{\frac{q}{k}}$$

relating the height of the ground-water above the drain level, (h), the distance apart of the drains (E), the rate at which water enters the drains (q), and the soil permeability (k). The same problem has recently been taken up in more detail, but on similar lines, by Kozeny (Ref. 60) and Diserens (Ref. 61).

Flodkvist (Ref. 62) measured the outflow rates from drainage systems in several heavy soils in Sweden, and found that they fluctuated much more violently than was to be expected on the simple theory given above. After heavy rain the rate generally rose rapidly to a very high maximum, and then fell almost equally rapidly to a much lower value, from which it gradually decreased to zero. He considered that this type of response could be explained most satisfactorily on the assumption that the undisturbed subsoil was almost impermeable and that the surplus water reached the drains by way of the disturbed soil vertically above the drains, which had been dug out and replaced when the system was constructed. He was able to show by experiment that the soil above the drain was in fact much more permeable than the undisturbed subsoil elsewhere in the field, even in very old systems.

Nicholson (Ref. 63) has measured the outflow rates from mole drains in a heavy soil at Cambridge, and has obtained curves which are very similar to those of Flodkvist. He has also shown that the form of the curves is determined to some extent by the nature of the soil, the type of cultivation, and the previous weather.

Soil Examination and Advice about Drainage.

Drainage schemes, like other soil improvements, are much more closely regulated by soil analysis on the Continent than in England. In our drainage schemes, for example, the depth of the drains and the distance between them are matters of guesswork on the part of the drainage contractor. In Central Europe, where there is no money to spare for costly mistakes, the soil is analysed to find out something about it and, on the strength of this information, the most suitable depth and distances are estimated. There is still a great deal to be done before the methods are wholly satisfactory, but there is no question that the procedure is sound; the scientific method is perpetually improving while the guessing method never can get very far and a ripe experience gained at the general expense dies with the owner.

This subject has been discussed at some length by J. L. Russell (Ref. 64).

The soil properties most commonly used on the Continent in advising in regard to drainage are :—

1. Mechanical composition, usually expressed as the percentage of particles smaller than 0·01 mm. diam. (Kopecky, Ref. 65), or else smaller than 0·002 mm. diam. (Zunker, Ref. 66).
2. Hygroscopicity (Mitscherlich, Ref. 67).
3. Heat of wetting (Janert, Ref. 68).
4. Specific surface, calculated either from the mechanical composition or the permeability of the soil (Zunker, Ref. 69).
5. Base exchange capacity (Schofield, Ref. 70).

This last-mentioned method has not yet been applied to any great extent to drainage problems, but it appears to be very suitable for the purpose.

A number of empirical formulæ or curves have been put forward to express the relation between each soil type, as determined by one of the above methods, and the drain depth and distance apart which are considered by practical experience to be the best for that soil. Examples are given by Zunker (Ref. 71), Fauser (Ref. 72) and Janert (Ref. 73). Zunker, for instance, arrived at the following empirical formula relating optimum drain distance (E) to the specific surface (U) of the soil, under the conditions obtaining in Eastern Germany: $E=30-2\sqrt[3]{U}$ metres.

The most generally used of these methods of classification have been compared with each other in two investigations carried out in Germany (Ref. 74) and Finland (Ref. 75) respec-

tively. In both cases it was found that there was little to choose between the different methods, although both Zunker and Keso considered that mechanical analysis gave a slightly more satisfactory classification than the hygroscopicity and heat of wetting. This advantage is offset, however, by the fact that the heat of wetting (and also the base exchange capacity) determinations are cheaper and more rapid—an important consideration where routine determinations must be made.

Soil Classification.

A proper system of soil classification is an indispensable basis of any extended study of soils. Most English farmers think of our soils as being very varied, as indeed they are, in productive power. But apart from this they do not vary anything like as much as the soils of large Continental regions. The study of soil classification began in Russia some 50 years ago and since then there has developed a science dealing with soil as such, quite apart from its agricultural and horticultural value. This science is called pedology, and an interesting summary of its present position has been published by G. V. Jacks (Ref. 76). Soils are classified not according to their agricultural values, but according to the environments in which they are formed. Certain combinations of environmental conditions—climate, vegetation, geology, drainage, etc.—lead to the formation of definite soil types, distinguishable by the colour and structure of the soil profile. Most of these soil types have received Russian names such as *podsol*, the soil type of the northern coniferous forest regions, *chernozem*, a certain kind of the black earth of prairies and steppes, *solonchak*, the salty soil of semi-desert regions, and *solenetz*, also a black soil. An important practical feature of this system of classification is that the same soil type may develop from different combinations of environmental factors, *e.g.*, one type may form from an acid rock under a low rainfall or from a basic rock under a high rainfall. As a general rule, however, regions with the same soil type have similar agricultural possibilities, since the identity of soil type indicates that differences in climate, geology, topography, etc., cancel each other out. The pedological or "genetic" classification thus enables one broadly to classify regions by inspection of the soil profiles, and to compare regions in widely separated parts of the world. A chernozem region is suitable for wheat or arable farming, whether in Russia, America, Argentina or Australia, and a podsol region, wherever it may be, is pre-eminently a forest region. There is wide scope for the application of pedological principles to the modern schemes of national planning from

which the agricultural economics of the future will develop.

In this country the classification is not particularly helpful as most of our soils fall within one or two groups. A finer method of investigation is, therefore, needed, and this is provided by soil analysis.

Soil Analysis.

Steady progress continues to be made on the subject of soil analysis but it is still very far from being in the position of affording guidance as to the manuring of soil. It is now recognised that soil analysis is really meant to deal with three separate problems :—

1. Scientific investigation of the soil.
2. Soil surveys, where the purpose is to characterise soils, showing which soils are like others, and if they differ, wherein the difference lies.
3. Advisory purposes, especially in regard to the drainage and the manuring of land.

It is not necessary here to refer to the work done during 1933 on the improvement of soil analysis for scientific purposes ; this is described by Dr. Crowther in the Reports of the Progress of Applied Chemistry for 1933 (Ref. 77). The methods used for soil surveys and for advisory purposes are grouped under two divisions, mechanical and chemical, and these have both been studied a good deal recently. The methods for mechanical analysis have been re-examined in considerable detail by the members of the 1st Commission of the International Society for the Study of Soil Science and the results reported at the conference at Versailles in July 1934. Two distinct methods are adopted, one called " A " for use in scientific investigations where information is desired about the ultimate particles of which the soil is made up ; the other called " B " for use where advice is to be given about drainage or similar matters. Precise instructions for the " A " method have been drawn up by the Commission (Ref. 78) and subjected to rigorous tests ; for most soils it is now quite satisfactory ; for a few, however, *e.g.*, certain New Zealand volcanic ash soils, it needs modification.

In spite of all the investigations and the progress of the past 40 years mechanical analysis of soil still suffers from the defect that it cannot deal with soils containing large quantities of calcium carbonate. J. A. Prescott has pointed out that in the " mallee soils " of Australia, 40 per cent. of the clay fraction is calcium carbonate, yet it is all removed before mechanical analysis begins. Some method is urgently needed for taking account of the calcium in such soils. Similarly mechanical analysis still breaks down for soils rich in organic matter.

The "B" method is for use in advising about soil improvement, reclamation, drainage and other practical purposes.

Exchangeable Bases. Another important property of the soil, much studied now in soil investigations, is the quantity of exchangeable bases present—often spoken of as the base exchange capacity. The exchangeable bases are those which are easily removed from the soil when a soluble salt is added. Way showed many years ago that addition of sulphate of ammonia to the soil caused a displacement of calcium, and this is now known to be a general property of soils and salts. Broadly speaking fertile soils have a relatively high content of exchangeable calcium while acid infertile soils have not.

The problems associated with exchangeable bases are discussed in a recent Technical Communication of the Imperial Bureau of Soil Science (Ref. 79). Both the chemical and the physical properties of soils, particularly of heavy soils, are closely connected with the nature of the exchangeable bases (lime, potash, soda, etc.) held by the clay and humus. The optimum conditions represented by a crumbly tilth are associated with a large proportion of exchangeable calcium, while a deficiency of exchangeable bases results in acidity and a corresponding deterioration of the physical, chemical and biological properties of the soil. The extreme stickiness which renders unworkable many soils of dry regions is associated with a high proportion of exchangeable sodium. The absorbed or "exchangeable" bases have so great an influence on fertility that their determination is one of the most important parts of soil analysis. Owing to the complex constitution of soils, each type requires special treatment, and in the Technical Communication the methods adapted to different soil types are compared and described in detail. The paper is essentially a laboratory manual for soil chemists, and is an up-to-date revision of an earlier Technical Communication on the same subject, published four years ago.

Soil Surveys.

Many efforts are now being made to find simple and rapid tests for showing, in a given region, which areas of soil are alike and which differ. The purpose is to answer a practical problem frequently put nowadays, especially in tropical and subtropical countries where cultivation of a crop is expanding, but where the growers are very anxious to expand only on to the best land; having found a good piece of land on which the crop grows really well, what tests can be used to find out whether other areas of land are equally good? The subject has recently been discussed by B. A. Keen (Ref. 80) who summarises a great

amount of work done in the search for some single factor or property which would suffice to characterise the soil accurately enough for the purpose. He and Coutts had already worked out and applied various simple tests to a number of soils (Ref. 81). The results have been subjected by E. W. Russell (Ref. 82) to statistical examination which brought out the fact that some of these properties are so closely associated with the same soil constituent that their separate determinations only amounts to saying the same thing in other words. Thus the "sticky point", the moisture content at 50 per cent. relative humidity, and the water-holding capacity as estimated by the Keen-Rackzkowsky box method, also the heat of wetting of a dry soil, are all so closely related to the quantity of exchangeable bases present (*i.e.*, the base-exchange capacity of the soil), that there is no point in determining more than one of them. These particular properties were not related to any important extent to the clay content of the soil. The xylene equivalent wa related, though not closely, to the clay and silt contents, and it appeared to be unaffected by the amount of organic matter present while the moisture equivalent was closely related both to the xylene equivalent and the base exchange capacity. Having ascertained the water holding capacity and the base exchange capacity nothing more was gained by making any other of these particular determinations on the soil.

A relationship found on one soil type does not necessarily hold on another, and when data for soils from such distant regions as Grenada, Trinidad, Nyasaland, the Spanish Levant and Malaya were examined then the points did not all fall on the same line. For ordinary agricultural practice of course this is not a very serious objection.

A simple test was found to distinguish between the fertile and the unfertile soils of one region—Malaya—from which a considerable number of samples of known productiveness were obtained. The loss on ignition of oven-dried soil exceeded 6·5 per cent. in the good soils, but fell below it in the poor ones. The result is frankly empirical, but it is very useful to the man called on to advise where the next planting should be done and what areas should be avoided.

The amount of lime required to counteract the acidity of an acid soil is usually estimated by one of the rapid "lime requirement" analytical methods. Some of these give useful results in the hands of a competent and experienced analyst who knows the soils with which he is dealing, but they are by no means absolute and should never be used excepting after standardisation by field tests. The dificulty is that the "requirement" or "titration" is not a single definite figure but depends on the conditions of the experiment, especially on the reaction (or pH) of the solution.

The titration curves are now being fully studied by R. K. Schofield and considerable light is being thrown on this very complex subject (Ref. 83).

SOIL SURVEYS IN ENGLAND AND WALES.

For many years past soil surveys have been in progress in England and Wales, but only occasionally has anything been published. The *Empire Journal of Experimental Agriculture* has now arranged to issue some of the results; the first accounts are by W. Morley Davies and G. Owen of the soils of North Shropshire (Ref. 85) and by G. W. Robinson of the soils of Wales (Ref. 86).

A brief description of certain limestone soils in Derbyshire and Somerset, but without chemical or mechanical analyses, is given by A. J. Low (Ref. 84).

THE IMPERIAL BUREAU OF SOIL SCIENCE.

The methods for studying soil are now so numerous and often so complex, and the numbers of investigations on soil are so great, that special means have had to be adopted to cope with them.

The Imperial Bureau of Soil Science was set up in 1928 to assist research workers and advisory officers in the important, but, to the individual worker, almost impossible, task of keeping abreast of the new literature on soil science and related subjects. It keeps a complete classified index of nearly all the papers dealing with soils and fertilisers published throughout the world, and from this index it can quickly lay hands on any paper bearing on the work of any agricultural officer or the investigations of any research worker. The Bureau now indexes some 3,000 new papers every year; it prepares short abstracts of all the papers seen, and issues monthly lists[1] of the abstracts to all interested research workers and institutes in the Empire. A worker interested in a particular paper can then write to the Bureau for further details, and will receive from it either a reprint of the paper, if procurable, or a full abstract. The Bureau undertakes translations from the numerous European languages in which many of the most important scientific papers are now written. Workers within the Empire can thus keep in constant touch with the progress of soil science in every part of the world. Equally important as the Bureau's index accumulates, it will be possible to refer agricultural and soil experts to past work which might otherwise have been lost and forgotten in the ever-growing mass of new scientific literature. The Bureau has answered many enquiries sent in from all parts of the Empire which have involved detailed

[1] *Publications relating to Soils and Fertilisers.* Obtainable from the Bureau, price 10*s.* per annum, post free.

searches through journals and books both new and old. It has only been in existence for five years, but its index already contains references to 10,000 papers published during that time. The literature covered by these papers ranges from the purely scientific through all stages of applied science to the purely practical. There is a long chain of investigation between a scientific discovery and its practical application, and one of the Bureau's aims is to supply the missing links in the chain, whenever they occur.

An important set of bulletins issued by the Bureau is the series of *Technical Communications*, of which 31 have been issued to date. Subjects for Technical Communications are selected from those in which a wide interest has been shown by Empire workers, or in which interest would be shown were information on them readily available. There are some subjects on which the literature is particularly large and diffuse, and in such cases Technical Communications are useful in presenting an easily readable and impartial summary of the present position.

The Bureau has been largely responsible for securing the posthumus publication of a remarkable monograph[1] on tropical soil-forming processes by Sir J. B. Harrison, late Director of Agriculture in British Guiana. Before his death in 1926, Harrison had incorporated the results of 37 years of observation in a manuscript which was later discovered by Mr. R. Follett-Smith and forwarded to the Bureau by Prof. F. Hardy of the Imperial College of Tropical Agriculture, Trinidad. For a variety of reasons the usual channels of publication were not available, and the Bureau was prevented by its constitution from using its own funds to finance the publication of original research. But, thanks to the generosity of the British Association and of Demarara Proprietors, Ltd., the necessary funds for printing were obtained, and the Bureau undertook the publication of the manuscript after it had been revised by Prof. Hardy. Harrison's knowledge of his subject was unrivalled, and it is doubtful whether another study on tropical soil formation, comparable with this in accuracy and detail, exists. Through the action of the donors of the printing fund the Bureau has been able to avert the scientific tragedy which would have been involved in the loss of a great and unique work.

Russian Agricultural Developments.

During the summer of 1934 I revisited Russia to see the agricultural changes since my visit of 1930. At the present

[1] *The Katamorphism of Igneous Rocks under Humid Tropical Conditions*, Imperial Bureau of Soil Science, Rothamsted Experimental Station, 1934, price *5s.* net.

time Russia is one of the most interesting countries in the world for the agriculturist by reason of the colossal scale of the experiment in agricultural planning now in progress there. When the Revolution was organised it was confidently expected that the peasant would follow the factory workers ; in Lenin's view the town workers were to make the Revolution and the peasants to support it. So the peasants did, as long as they had hopes of securing land for themselves, but they showed little interest in the political theories underlying the Revolution, and as soon as it was clear that they were not to have the land troubles arose. There has been continuous difficulty about fitting food production into the general scheme of things in Russia and the problem is not even yet solved. Clearly the technique of revolution is not yet fully worked out, and the methods successful for factory workers do not appear to answer for farm workers. The old system of agriculture throughout large parts of Northern and Central Russia was a three-course rotation formerly common in Northern Europe : fallow, winter corn (usually rye), then spring corn (oats, barley, flax and other grains) ; this was also the old system in Great Britain. There was the further resemblance to our old system that the land was divided into strips which were shared among the peasants, but each man's total holding was scattered over a wide area. The system is not only inefficient, but it is also incapable of much improvement ; in our own country the scattered holdings had to be consolidated and the land brought into larger units before any important advances could be made.

Naturally, considerable changes were attempted after the Revolution. Serious efforts were made at first (1918 onwards) to run State farms on Marxist principles, but later they were largely abolished and even now these cover only about 15 per cent of the total cultivated area ; apparently they are affected by some unexpected difficulty. They failed also after the French Revolution. Then for the period of the New Economic Policy (NEP: 1921–1927) the peasants were encouraged to produce all they could and to sell at as high prices as possible, stirred by Bukharin's famous slogan, " Peasants, get yourselves rich." This system yielded food but proved politically objectionable, and, from 1928 onwards, the peasants who had tried to become rich were disposessed. The method of collectivisation was tried ; it has been pushed so vigorously that most of the grain area is collectivised.

On this system all the peasants remaining in the village are brought together into a single body and all the farming land into a single unit. The peasant body then proceeds to elect a managing committee or Soviet of 7 members, the chairman of which, however, is supplied by the Party ; in addition there is

also the Party agent, and these two largely control the whole organisation. The new system has the advantage of doing away with the old inefficient strip farming and setting up large units ; the collective farming may run to 3,000 or 5,000 acres, the arable part of which is divided up into 5 or 6 fields of 100 or 200 acres each. Large cultivating implements can thus be used, efficient manuring becomes possible, new varieties of crops and new systems of husbandry can be introduced under the guidance of the Soil and Fertiliser Research Institutes. The machinery is hired from the Motor Tractor Stations and is in charge of trained mechanics acting under the advice of trained agronomists. Factories have been set up for producing the necessary amounts of fertiliser, and plant breeding stations and seed farms for producing and multiplying improved varieties of the different crops. In principle the system is capable of being made very efficient on the technical side ; the scientific advice is good ; it is adopted by the farms ; the necessary machinery can, at any rate in principle, be hired for doing the work. In practice, of course, there are many hitches.

The planning is very complete. The Central Government decides that certain quantities of the various agricultural products are required and allocates to each of the constituent Republics its share in the production. A counter plan may be put forward, but ultimately agreement is reached. Each Government then allocates to the Regional Commissars the share of each Region in the work ; and each Commissar allocates shares to the District Commissars. These call together the chairmen of the collective farms in the district and between them the various quotas are assigned so that each farm knows what it is expected to produce : each has its " plan ". The Chairman must put the plan through, and the political officer, the Party Agent, is there to see that he does it.

By the political principles of the Party the individuals working on the farms are not allowed to own any important means of production ; the ordinary small implements are owned by the collective farm as a whole, but the large implements such as tractors or combines are the property of the Government and must be hired from the Motor Tractor Station. The workers are not paid regular wages ; they receive instead a share of the produce based on the amount of work they have done. The farm must deliver to the Government certain quantities of grain (about 100 lb. per acre ordered to be sown) for which a small price is paid : it must also pay the Motor Tractor Station in grain, and, of course, save seed for the following year. These demands may take 30 to 60 per cent. of the produce ; the rest is divided among the workers according to the number of unit days' work they have accomplished. A " unit

day's work " is agreed upon and for this an agreed remuneration is given; some workers can do $1\frac{1}{2}$ units per actual day while others can do only $\frac{3}{4}$ of a unit. The number of days' work in a year also varies. The actual pay, therefore, is not the same for all. Payment is largely in kind; I met cases where the " unit day's pay " consisted of 7 lb. grain, several pounds of vegetables, and 1 to 3 roubles. On one farm, for example (Spitsky, near Kiev), the " unit day's " pay was $2\frac{1}{4}$ lb. grain, 11 lb. potatoes, $6\frac{1}{2}$ lb. vegetables, $\frac{1}{4}$ lb. apples, 16 lb. fodder and 79 kopecks in cash. In addition the peasant is permitted to have a piece of garden to grow his own vegetables; also, if he can get them, a cow, a pig, and poultry, but no more than he himself can look after; he is not allowed to hire any help whatsoever. Of course, he has not yet got all these things, but if and when he does obtain them, his life should not be too hard as compared with the old days. The peasant may sell whatever of his share of grain, vegetables or milk he does not want for himself and his family. He does this in the so-called open market.[1]

How long the system will last is not clear. I was several times told that it did not accord with Communist principles and, therefore, in spite of a certain success in producing grain and vegetables it would have to be given up and replaced by some form of State farming which has not yet been worked out. Obviously there remains a great deal to be done by the planners of Russian agriculture.

The problem of the Russian agriculturist is very different from that of the British farmer. In Russia, out of a population of 164 millions, no less than 124 millions are directly dependent on agriculture—roughly 75 per cent. of the population. Thus three country people, besides feeding themselves, have to feed one other person. The food produced is mainly black bread and vegetables for making into cabbage soup; the Russians do not eat meat, butter and cheese to anything like the extent that we do. In Great Britain the total population is about 45 millions, of whom about 7 per cent. are directly dependent on agriculture, and their working members produce about 35 per cent. of the food of the nation—food which is, of course, considerably better and richer than the Russians receive. On this basis three country people, besides feeding themselves, have to feed 14 others as well. One might sum it up by saying that as a productive agent British agriculture is at least four or five times as effective as Russian agriculture. The Russians are, however,

[1] A detailed account of the system is given in *Collectivised Agriculture in the Soviet Union*, School of Slavonic Studies, Univ. of London Monograph No. 2, 1934. In the collective farms I visited the peasants seemed to have a larger share of produce allocated to them than in the instances quoted in this Monograph. I had, however, no means of assessing their actual receipts.

making great efforts at improvement and their scientific work is largely directed to practical ends.

Yields are low. Wheat in the really good districts averages about 15 bushels per acre; a dairy herd, reckoned very good, averaged 200 gall. of milk per cow; potatoes, on a good farm that I visited, averaged about 4 to 5 tons per acre; and fodder roots, which correspond to our mangolds, about 9 tons per acre. Improvement is difficult because difficult natural conditions have to be dealt with. On the live-stock side especially the difficulties seem to be very great. During the four years 1930 to 1933, when collectivisation was being pushed, the numbers of animals fell off heavily from the levels of 1929; cattle, pigs and horses were reduced to little over half and the sheep and goats nearly to one-third. It is necessarily a slow business pulling these numbers up again.

Two great schemes promise important results if they mature. One is a vast irrigation scheme to reclaim an immense area of waste on the east bank of the lower Volga in the old German region. The total area involved is 10 million acres and the hope is that 5 million tons of wheat annually may be obtained from it; as only half the area is to be sown each year this will necessitate an annual average yield of 37·3 bushels per acre. The whole scheme is in charge of Prof. E. G. Alexandrov, and the general scientific supervision is entrusted to the Saratov Agricultural Institute under the guidance of Prof. Tulaikoff, well known to English and American agricultural experts for his admirable investigations. One may be sure that there will be nothing lacking on the scientific side. The other possibility of improvement is the northern extension of the zone of cultivation of crops like wheat, sugar beet and others at present grown only in the south. The summer temperature in the northern regions is adequate for these crops while it lasts, but they are not as yet cultivated there because the summer is too short to allow full growth. It is the same problem as confronted the Canadian agriculturists in their efforts to extend the wheat belt northwards; they have met it by producing new varieties (Marquis, Reward, etc.) having a shorter growing season. In Russia the difficulty is overcome by partially germinating the seeds before they are sown: the process is called Vernalisation. It is the same as the boxing of potatoes, and it shortens the time needed for growth sufficiently to enable the crop to ripen further north than could otherwise have been possible. The process is used fairly widely for wheat in the south so as to help in avoiding loss from rust, from drought, and from the hot July and August winds that shrivel the grain before it can be harvested. This trouble it is also hoped to mitigate in places by planting shelter belts of trees.

The Russian Soil Institutes.

The central soil institute of Russia, the Dokuchaieff Institute, was till recently at Leningrad; now it is in process of transfer to Moscow where the Timiriazeff Institute is already established for the study of fertilisers. The soil institute is well known for its remarkable collection of soil profiles and for the excellent soil maps constructed there; its activities cover the whole of Russia and the constituent republics. The advantage of contralising the work is to ensure uniformity of surveying and of mapping. The survey is not restricted to land already in cultivation: it is extended to the whole area. Much of the land now waste is capable of being utilised and the map shows areas in which reclamation could be undertaken. The staff includes such well-known soil scientists as Boris Polynov, Tiurin, Antipov-Karakaev, Prassolov and Kirsanoff.

Alongside of the survey there are undertaken chemical and mechanical analyses and vegetation experiments. In the maps finally set out there are tables giving typical analytical results for the various kinds of soils and typical responses to fertilisers by the chief crops. The maps thus serve as guidance to the agricultural officers and they show at once the manurial and lime deficiencies of the soils and the ways in which these can best be remedied. This application of chemistry to practical agriculture is called "Chemisation of the Soil"; it is very much on the lines introduced into English practice by Augustus Voelcker (father of the present Dr. Voelcker) in the 1860's, and much used here since; but it is much more systematically applied.

These maps, and the data furnished by the soil examination, play a great part in agricultural planning by showing the extent of the soil resources of the country. They have assumed increased importance with the extension of the collectivised farms which can be treated with fertilisers as soon as proper recipes have been worked out.

A great amount of work is done on fertilisers. This is done under the general direction of N. Prianischnikoff, one of the leading experts on the subject. Until comparatively recently but little fertiliser was used in Russia; in future it is hoped to use a great deal. Great deposits of phosphate have been found in the north and large superphosphate works have been set up[1] which now turn out considerable quantities of fertiliser. Extensive deposits of potash salts also exist in the Urals, north of Perm, and these are now being worked. Factories for the manufacture of synthetic nitrogen fertilisers are in

[1] For location of the deposits and works see *Fert. and Feed. Stuffs Jl.*, 1934, Vol. 19, p. 293.

operation and much experimental work is undertaken to discover whether an ammonium salt or a nitrate is in general the better. The pot-culture houses at the Timiriazeff Institute are of enormous size, vastly greater than anything in this country, and large numbers of tests can go on simultaneously.

The field experiments are so arranged as to discover what fertilisers are needed in the different soil zones for different crops, how they are best applied, and what is the best way of using them under conditions of crop rotation.

Much work is done on the effect of chlorides on the growth of the crop: its practical interest lies in the fact that the natural potassic fertiliser contains a good deal of chloride. As shown in other countries, potatoes and tobacco suffer both in yield and quality when the dressing of chloride exceeds a certain amount. Flax and cabbage are less affected (Ref. 87).

Considerable work is done under Prof. Tiulin on the texture and physical constitution of the soil; good summaries have recently been published (Ref. 88). The work of Gedroiz on the intimate structure of the soil is continued.

Much work is also done on tillage. Its importance arises from the fact that the transition of agriculture from the peasant strips to the big collectivised fields involves the use of large heavy implements, moving relatively quickly over the ground, and, therefore, compacting and otherwise affecting the soil in a way quite unknown before. Studies are, therefore, being made of the nature of the work to be done, of the design of implement best calculated to do it, and of the effects actually produced on the soil by the existing implements. All this work is in its early stages; its further development will be watched.

The work deals not only with the ordinary artificial fertilisers, but also with organic manures. The changes in agricultural system in the last four years has been accompanied by an enormous fall in the numbers of live-stock, and farmyard manure is hardly obtainable. Much attention is, therefore, paid to the possibility of using composts either of peat or of vegetable residues such as straw.

The well known Adco process, devised at Rothamsted, has been tested, and attempts are made to use the nitrogen-fixing organism Azotobacter for the aerobic process (Ref. 89). If successful this would be quite useful. It is hoped also to devise means whereby the marsh gas given off in the anaerobic process may be utilised commercially. This is an old problem and many will remember how, years ago, Lord Iveagh (then Lord Elvedon) utilised the gas for small-scale heating.

Other experiments deal with the conservation of farmyard manure with the hope of producing standard methods for adoption on the Collective and State farms (Ref. 90).

Many other investigations on soil microbiology are also made, but space does not permit of an account of them ; they have, however, recently been described by Uspensky (Ref. 91). This subject is assuming greater importance now that leguminous plants are being more extensively cultivated. On the old system there was only a small area under these crops. Some interesting studies of partial sterilisation are also made for the treatment of such soils.

The Ukrainian Soil Institute.

At Kiev, the capital of Ukraine, there is a large Institute for soil and fertiliser research under the leadership of Profs. A. I. Dushechkin, M. M. Godlin, and A. T. Kalachikov. It may be taken as a good illustration of the Russian Institutes and its activities both in laboratory investigations and in field advisory services are typical of the way these organisations work. The programme has obvious connection with that of the Moscow Institute. The laboratory investigations are in the main concerned with the finding of methods for examining and grouping the soils. Thus there are investigations on the possibility of using hydrogen peroxide to distinguish between the organic and the inorganic phosphorus compounds of the soil (it being presumed that only the latter are of use to the plant), the methods of determining lime requirement, base exchange capacity, physical composition, plasticity, etc. ; suitable ones are selected for use. The possibility of using a mould (*Aspergillus oryzae*) for the study of the phosphorus and nitrogen in the soil is also being investigated and a comparison is made between the azotobacter and the chemical methods of estimating lime and phosphate needs of a soil. On the crop-production side studies of the various methods of applying fertilisers have shown that they give better results when put well into the soil under the plant than when applied on the surface, but the best depth depends on the crop and on the conditions : in the particular experiments quoted the yield of cabbage was 12 per cent. better when the fertiliser (nitrophoska) was applied 8 in. below the surface than when it was applied on the top. Magnesium sulphate and sodium chloride are shown to be advantageous for sugar beet, especially when the nitrogen is supplied by sulphate of ammonia ; they increased the yields considerably and prevented the fall in sugar-content that is associated with nitrogenous manuring ; the difference in sugar-content between plants with and those without magnesium sulphate rose to as much as 1 per cent.

The acidifying effect of sulphate of ammonia on soil is attributed to the ammonium radicle on the Chernozem soils

saturated with bases, and to the acid radicle on the podsolised forest soils (Ref. 92).

Other experiments show that sylvinit (a salt very like the French kainit) did not appreciably alter the moisture content of the soil during 1933, but that it slightly increased the acidity of the soil. It increased the yield of potatoes but lowered the percentage of dry matter and of starch—the consequence of its chlorine content. This effect may be avoided by applying the sylvinit in autumn so as to permit the washing out of the chloride during the winter; on very light soils, however, when potash might be lost, the applications could be in early spring. Sewage sludges were tried as fertilisers for cabbages and potatoes on a podsolised loess loam and feebly podsolised sand near Kiev, and, in spite of their poor composition (2·2—2·7 per cent. nitrogen (N); 0·7 per cent. phosphoric acid (P_2O_5) and 0·5—0·6 per cent. potash (K_2O)—figures that could easily be paralleled in England) gave considerable increases in crop when applied at the rate of 10 tons per acre. Other enquiries deal with the use of sewage in growing other vegetables. Physical studies are also made of the elasticity of the soil and its resistance to deformation, and the conclusion is reached that, from a mechanical point of view, a shearing or pulling action is more desirable in soil tillage than a compression. Some good work is being done, under the direction of Prof. P. Vassilenko, on the effect of cultivation on the soil.

All these problems are being studied at other soil institutes in various parts of the world and the Kiev results are in general accord with those observed elsewhere. The immediate purpose is to apply knowledge already gained to the practical problems of the State and Collective farms.

Two lines of work are, however, being developed more fully here and at certain other Russian Soil Institutes generally than at most other similar stations; the study of the effects of cultivation on the soil and the making of soil maps. The mapping of the soil has been very well done in the Kiev district and the maps deal adequately with some of the large collective farms—the intention is to deal with all.

Broadly speaking one may say that science is well used in the State planning of Agriculture in Russia. The profession of agricultural expert is not free from risk, and he works under the disadvantage that Russia is in a hurry and requires results quickly, so that the experiment and the large-scale application often have to go on simultaneously. But on the technical and scientific side considerable advances have been made in the past five years and more may confidently be expected.

Land Reclamation in Scotland: The Work of the Macaulay Institute.

The Macaulay Institute for Soil Research, Craigiebuckler, Aberdeen, has for the past five years been engaged in the mapping of the Scottish soils, the study of their productive capacity, and the best methods of improving them. The work has been much influenced by the Russian soil science and by the German fertiliser experiments, but it is proceeding on its own lines and the excellent staff is capable of furnishing sound advice to the Scottish farmer. The Director, Dr. Ogg, has favoured me with the following notes on the recent work of the Institute. He emphasises the special need for soil work in Scotland, where much of the land is not yet used to the fullest possible extent. Of a total area of 19 million acres only about 4½ million acres is under crops and grass, of which about 1½ million acres is permanent grass; forests account for nearly a million acres, deer forests for 3½ million acres, and the remainder, amounting to about half the total area of the country, consists of mountain and heath land used as rough grazing. In the past 40 years there has been a decline of a quarter of a million acres in the area under crops and grass, and in recent years much arable land has been laid down to permanent grass.

Much of the uncultivated four-fifths of Scotland can never be cultivated on account of altitude and steepness of slope, but about one-third of the total area of the country is at an altitude of less than 1,000 ft., which may be regarded as about the limit of cultivation. There is room, therefore, for a very great increase in the cultivated area.

Most of the cultivated land lies in the great central valley which stretches across Scotland in a south-westerly and north-easterly direction from coast to coast, and in the broad shelf which lies along the east coast from Stonehaven to the extreme north. The area already under cultivation could be much improved, but the greatest scope is in the uncultivated land, up to an altitude of 2,000 ft. Some of this land is under forest, and some of it carries good natural pasture for sheep, and to a less extent for cattle, but great areas are under Calluna or very poor grass, such as Nardus. Much of the land does not carry one sheep to 5 acres, and some of it would be much better under timber.

The first step in improving an area is to survey the soils (Ref. 93) and study their chemical and physical composition and their manurial requirements. As soon as a plan of cropping is agreed upon the appropriate scheme of liming and manurial treatment can be prepared, and modified as experience grows. One of the most important lines of work is the study of the peat

areas. Moor culture stations are well known on the Continent, and good examples are found in Sweden, Germany and Finland, but the Macaulay Institute has established the first in Great Britain in the Island of Lewis.

The Peat Farm, Lewis (Ref. 94). The reclamation of this farm of 150 acres of really bad peat bog was begun in 1929. The peat varies in depth from about 3 ft. to over 20 ft. The surface vegetation is mainly Deers' Hair (*Scirpus caespitosus*) with poorly developed Ling (*Calluna*) in places, and under natural conditions would not support a sheep to 10 or 20 acres. The surface peat is pseudo-fibrous, brownish and highly colloidal. The lower peat is soft and slimy ; when squeezed in the hand it oozes through the fingers like porridge.

Drainage is very difficult, and the problem has not yet been satisfactorily solved. Wooden box drains a chain apart are used, leading into secondary drains, which in turn discharge into a main drainage channel. Although the bog has been dried considerably by this means there are still many wet spots. The slimy nature of the peat causes difficulty, and it is not unusual to find water standing on a piece of bog within 2 yds. of a deep open drain. As the peat becomes oxidised, however, drainage improves greatly, and part of the farm which has been cultivated for three years shows marked improvement.

Excellent pasture, comparing favourably with first-class pastures on good mineral soil, has been established, and for three years a dozen dairy cows have been grazed on this farm. Excellent hay has been grown, also satisfactory silage crops, oats, potatoes and market garden crops on a small scale.

The arable land is drained, dressed with shell sand, cultivated by means of a rotary moorland cultivator, and manured. The soil is markedly deficient in lime and phosphate and also in potash, while the nitrogen is not available to plants until the peat decomposes. The grazing land is dressed with shell sand, sea weed or farmyard manure and phosphate, and seeded with grass and clover seed cleanings. At a comparatively small cost it is possible in this way to establish good pasture full of clover.

Upland Grass Improvement (Ref. 95).

Experiments on land improvement have also been going on in the south of Scotland in the Pentland Hills and the Southern Uplands. The work initiated by the late W. G. Smith on hill pastures in the Pentlands has been carried on by R. G. Heddle. There are 6 main types of natural hill pasture in this area : moist flush pasture, wet flush pasture, short dry grass, short grass with blaeberry, Nardus with blaeberry, and Nardus with under-grass. These vegetation types are wide-

spread in the south of Scotland, and probably occur extensively in other parts of the country. They are associated with certain types of soil profile : the short dry grass in on light soils derived from sands and gravels, having a high lime requirement and very low content of available phosphate ; the Nardus with under-grass is on gley soil derived from boulder clay ; the lime requirement is high and the available phosphate fairly low.

These types have been differentiated and studied in the field and in the laboratory, and liming and manuring tests have been carried out. Flushing with spring water rich in bases has been found to effect a marked improvement in the herbage, and a decided lowering in acidity and lime requirement of the soil.

The Use of Soils for Forestry.

An interesting discussion was held at the Aberdeen meeting of the British Association (September 1934) on the utilisation of land for grazing and for forestry. Naturally it is only soils unsuitable for agriculture that would be used for these purposes, and of these submarginal soils those worth a rental of more than about 3*s*. 6*d*. per acre per annum would continue to be used as at present for rough grazing and improved whenever it was thought worth while. Poorer land could be used for forestry and for this purpose might be worth about 2*s*. 6*d*. per acre per annum ; but it becomes unsuitable for forestry when it lies so high as to be subject to very strong winds, or when it is formed of deep wet peat not readily drained, or when it consists of almost bare rocks. Heavy soils do not usually come within the forestry category as they can usually be put to grass. A good many heavy soils in England are actually in wood, but this is largely because they always have been, and the cost of clearing and conversion to grass would now be too great to yield a profit. Very light soils in England are not infrequently afforested, though they could often be used for special systems of farming, such as the Hosier system, or for market gardening, for golf links or other purposes. Even when this is done the planting of shelter belts is very desirable to reduce the blowing of the soil ; an excellent example is furnished by the great scheme about to be inaugurated in the United States.

Various methods of improving rough grazing are known, and whenever economic conditions justify it this can be done. As the policy of the Forestry Commission is to plant only such land as is unsuitable for grazing, the true forest soils are those which, on the fertility scale, are inferior to grazing soils either because they lie higher, or on too steep a slope, or because they are much lighter or much more peaty. There are thus three kinds of soil on which planting is possible, or could be made so if

the soil could be improved: (1) steep slopes, (2) mineral soils too poor for grazing and not worth improving, (3) wet peats.

The mineral soils are of the podsol type (p. 203), they are being studied on sound lines at the various research institutes; their management is fairly well understood by foresters. Methods of drainage can no doubt be improved; better treatment of the hard pans may be devised, and it remains to be seen how far manuring of the trees is worth while. Much has still to be done in selecting the right varieties of trees for the different conditions. The same applies to the planting of steep slopes.[1] In regard to the peats, however, the position is different. Peat has not been much studied in this country; it embraces a number of widely different substances not at present easily characterised by soil chemists. Here there is a great amount of experimental work needed before the soil expert is in as strong a position as he is on the mineral soils. This peat work is being done at the Macaulay Institute by Dr. Fraser; it links on with the investigations on soil humus that have been in progress at Rothamsted for some years past; and at Rothamsted advantage is being taken of the recent acquisition of 60 acres of old woodland, soon to be completely felled by the vendors, to study the changes in the soil and the humus cover that set in after the clearing. These different investigations will proceed simultaneously and they cannot fail to add greatly to our knowledge of peat for afforestation purposes.

Soils and Fruit Culture.

Passing to the other end of the scale we come to soils used for fruit culture. These are much studied at Long Ashton by T. Wallace who has recently summarised the present knowledge of soil conditions in relation to quality in fruit (Ref. 96). The soil factors mainly affect the supply of nitrogen and of water to the tree. In wet districts the fruit of highest dessert quality is usually grown only on light soils in dry situations; while in dry regions these soils have to be avoided because in dry years they fail to mature their crops. For the Evesham district the best quality plums come from the light soils in wet seasons, and from the heavy clay soils in dry seasons. Clean culture provides a good supply of available nitrogen for the tree; grass culture greatly reduces it or even leads to nitrogen starvation. In general under high nitrogen conditions fruit size is increased, red flush is decreased, ground colour becomes greener, flesh is less white, firm and sweet, and is more juicy; keeping qualty is poorer both as regards rots and physiological breakdowns.

[1]For an account of the soils of a forest area see Alex. Muir, *The Soils of the Teindlaud State Forest, Forestry,* 1934, Vol. 8, pp. 25–55.

"High nitrogen" fruits are usually of superior culinary quality, but the highest dessert quality is frequently associated with relatively low nitrogen conditions. Failure to obtain normal responses to nitrogen is usually due to abnormally low cultural conditions or to potassium deficiency.

Potassium deficient apples are small, usually green, immature in appearance, and do not colour up in store; in some cases, however, notably of "Bramley's Seedlings" and "Bismarck", potassium deficient fruits may be of slightly higher colour than the "high potassium" fruits; colour may be markedly increased by potassic manures with varieties such as "Worcester Pearmain" or "Newton Wonder", whereas on the same plot, the treatment of "Bramley" may convert a slightly flushed, dwarfed type of fruit to a large green specimen. The deficient fruits may be slightly sweet, sub-acid and woody, and lack fullness of flavour; in chemical composition they show normal nitrogen content, generally low total acid, low ash content and low potash. In store they remain of immature appearance, shrivel severely but are usually free from rots; breakdown is uncommon in ordinary temperature store (exceptions have occurred), but in low temperature store, at 1°C., the deficient fruits may break down much more severely than comparable high-potassium fruits, pointing to the fact that the deficient fruits are injured by low temperatures. The fruits also have a tendency to breakdown in the cortex region when the high potassium fruits normally exhibit Core Flush.

The Cawthron Institute, Nelson, New Zealand.

Among the Research Institutes of the Empire the Cawthron Institute has always held a high place. It started work in 1920 under the directorship of Dr. T. H. Easterfield and the soil work has been from the first in charge of Dr. T. Rigg who had been trained at Cambridge and at Rothamsted; it has a continuous record of good work both practical and scientific. Dr. Easterfield has now retired and his place is taken by Dr. Rigg, but before leaving he delivered the Cawthron Centenary Lecture in which he summarises the achievements of the Institute (Ref. 97). On the soil side it well known for its admirable soil surveys for particular crops and for its work on deficiency diseases in animals, bush sickness in cattle (Ref. 98) and xanthin calculi in sheep, due to lack of certain minerals in the herbage. The Institute was fortunate in being able to secure so able a successor as Dr. Rigg, and further successes can be confidently anticipated.

Tropical Agriculture.

With the establishment of the *Empire Journal of Experimental Agriculture* in 1933 a means has now been provided whereby agricultural investigations made in any one part of the Empire may be made known to all others interested in the subject. Reference has been made in the preceding pages to many of the papers. Others definitely concerned with tropical agriculture may be mentioned here.

The effect of soil conditions on the root system of Coffea Arabica has been studied at the Amani Research Institute by F. J. Nutman (Ref. 99) and some exceedingly interesting results obtained.

The manuring of sugar cane has been discussed by H. H. Dodds (Ref. 100) (Natal) and P. E. Turner (Ref. 101) (Trinidad); manuring of tea by T. Eden (Ref. 102) and H. H. Mann (Ref. 103).

The properties of tropical red soils are desciibed by F. Hardy (Ref. 104) and of Cyprus soils, by A. Reifenberg and Elinor K. Ewbank (Ref. 105). Soil Surveys in Canada are described by A. H. Joel (Ref. 106) and in Australia by J. A. Prescott (Ref. 107).

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CONTEMPORARY AGRICULTURAL LAW.

I.—Legislation.

There are some Acts of Parliament passed in the last year which may affect and should be noticed by agriculturalists. Any Marketing Act passed during that period is dealt with in a separate article in this number.

The Road and Rail Traffic Act, 1933 (23 and 24 Geo. 5, c. 53), is important to the users of goods vehicles on the roads. It enacts that no person shall use a goods vehicle on a road for the carriage of goods (*a*) for hire or reward, or (*b*) in connection with any trade or business carried on by him except under a licence under Part I of the Act, and a " goods vehicle " means a motor vehicle constructed or adapted for the carriage of goods or a trailer so constructed or adapted (Section 1) ; but by Section 1 (5) (*c*) the carriage by a person engaged in agriculture in any locality in connection with the business of agriculture carried on by another person in that locality, in a vehicle which the person carrying them is authorised by a licence to use for the carriage of goods in connection with his agricultural business is not to be deemed a carriage for hire or reward. By Section 16, subject to regulations to be made under the section, the holder of a licence must keep current records showing the times of work and intervals of rest of drivers, the particulars of each journey and the greatest weight carried ; but a dispensation may be granted as regards particular vehicles and, if such vehicles are used in the business of agriculture, is to be granted unless withheld on special grounds.

By the Protection of Birds Act, 1933 (23 and 24, Geo. 5, c. 52), penalties are imposed on the taking of any wild bird, being one of a British species of any kind specified in the Schedule, with the intention of its being sold alive, or the selling or offering for sale any live bird of such species other than a close-ringed specimen bred in captivity.

The Agricultural Marketing (No. 2) Act, 1933 (24, Geo. 5, c. 1), is dealt with by a separate article.

The Arbitration Act, 1934 (24 and 25, Geo. 5, c. 14), makes several alterations in the law relating to arbitrations, but does not affect arbitrations under the Agricultural Holdings Act, 1923, except where so stated. It may, however, apply to arbitrations under leases or tenancy agreements dealing with agricultural property which section 16 of the Act of 1923 does not cover, and should, therefore, be borne in mind. By Section 1 an arbitration agreement is not to be discharged by the death of a party thereto. By Section 2, where a bankrupt is a party to

an agreement providing for arbitration on differences arising thereout, the provision as to arbitration is enforceable at the option of the trustee in bankruptcy; and where the bankrupt had, before the commencement of his bankruptcy, been a party to an arbitration agreement, and any matter to which the agreement applies requires to be determined for the purposes of the bankruptcy, then any other party to the agreement or, with the consent of the committee of inspection the trustee may apply to the Court having jurisdiction in the bankruptcy to have the matter in question determined by arbitration, and the Court may so order. Section 3 gives power to the Court to appoint arbitrators in the place of those removed or whose appointment is revoked. Section 4 deals with the case of three arbitrators. Section 5 provides for the appointment of an umpire where there are two arbitrators, and enables the Court on the application of any party to the reference to order the umpire to act as if he were sole arbitrator. Section 6 enables the Court to remove an arbitrator or umpire who fails to use reasonable dispatch. Section 7 gives power to arbitrators or umpires to order specific performance of any contract other than a contract for the sale of any interest in land and to make an interim award. Section 8 gives the same power to the Court to make orders in respect of the matters specified in the first Schedule (relating to security for costs, discovery of documents, affidavits, preservation of the property, etc.) in arbitrations as it has in actions. Section 9 provides for the statement of a question of law or of an award or part of an award in the form of a special case. By Section 10, where leave is given to enforce an award in the same manner as a judgment or order, judgment may be entered in the terms of the award. By Section 11 a sum directed to be paid by an award shall, unless otherwise directed, carry interest as a judgment debt. Section 12 renders void an agreement that either or both parties shall bear their own costs in any event, unless the dispute precedes the agreement. Section 13 provides for the taxation of the arbitrator's or umpire's fees. Section 14 enables the Court to give relief where the arbitrator is not impartial or the dispute referred involves a question of fraud. By Section 11 the Statutes of Limitation are made to apply to arbitrations in the same way as to proceedings in Court, but with power to the Court, where an award is set aside or it orders that the arbitration agreement shall cease to have effect, to exclude the period between the commencement of the arbitration and the order of the Court from the time prescribed by the statues. By Section 18, Section 16 of the Agricultural Holdings Act, 1923, is amended by making ss. 110–2 of the County Courts Act, 1923, apply to an arbitration under that Act as if it was an action in the County

Court, and by empowering the High Court to issue a writ of *habeas corpus ad testificandum* to bring up a prisoner confined under process in any civil matter for examination before an arbitrator appointed under that Act. By Section 20 this Act (except the provisions set out in the Second Schedule thereto) is to apply to every arbitration under any other Act as if the arbitration were pursuant to an arbitration agreement and that other Act were the Arbitration agreement, but not to arbitrations to which the principal Act (Arbitration Act, 1889) does not apply—see Agricultural Holdings Act, 1923, Section 16, sub. i.5, which excludes arbitrations under that Act.

The Supply of Water in Bulk Act, 1934 (24 and 25, Geo. 5, c. 15), was passed in consequence of the exceptional drought and shortage of water in this country, and empowers any statutory water undertakers to enter into, and carry out, agreements with other statutory water undertakers for giving and taking a supply of water in bulk, but only with the consent of the Minister of Health.

The Protection of Animals Act, 1934 (24 and 25, Geo. 5, c. 21), renders illegal any public performance involving the throwing or casting of or wrestling or struggling with any unbroken horse or untrained bull, or the riding or attempting to ride any horse or bull which has been stimulated by any treatment involving cruelty with the intention of making it buck during the performance.

Another Act passed in consequence of the drought is the Water Supplies (Exceptional Shortage Orders) Act, 1934, which by Section 1 gives power to the Minister of Health, in the case of a serious deficiency of supplies of water in any locality caused by exceptional shortage of rain, to make orders (*inter alia*) (*a*) authorising water undertakers to take water from any specified source ; (*b*) suspending or modifying any restriction or obligation on them as respects (i) taking of water from any source, (ii) the discharge of compensation water, (iii) the supply of water in any quantity or manner, or (iv) the filtration or other treatment of water ; (*c*) authorising the undertakers to impose limitations on the use of water by consumers generally. Section 2 gives power to authorise the execution of works and the entry on, and use of, land for the purposes of such order. By Section 3, where an order is made authorising the taking of water from a specified source and the Minister is satisfied that permanent works are necessary and that they can be constructed within six months, the order may authorise the taking of water for an indefinite period and the purchase of land. Section 5 imposes penalties for failure to comply with such orders. Section 6 provides for compensation. Section 7 deals with the making and determination of such claims. Section 10

provides a procedure for testing the validity of orders by an application to the High Court, but such application must be made by a person aggrieved within 21 days after publication of the notice of the making of the order in accordance with the provisions of the Schedule to the Act; otherwise the validity of the order may not be questioned. The Schedule deals with the procedure for making orders.

The Milk Act, 1934 (24 and 25, Geo. 5, c. 51), provides for a minimum return to milk producers for milk registered under a milk marketing scheme for milk used in the manufacture of milk products, but need not be mentioned in detail here.

The Cattle Industry (Emergency Provisions) Act, 1934 (24 and 25, Geo. 5, c. 54), makes provisions for payments to the producers of cattle. By Section 1 a fund to be known as "the Cattle Fund" is to be placed under the control of the Minister of Agriculture and Fisheries and the Secretaries of State concerned with agriculture in Scotland and Northern Ireland (called "the appropriate Ministers"). By Section 2 the appropriate Ministers may make payments out of the Cattle Fund to producers of cattle in respect of (*a*) steers, heifers or cow-heifers certified to conform with a standard prescribed by regulations of the said Ministers, or (*b*) carcases of such steers, heifers or cow-heifers, being animals or carcases sold in the United Kingdom by such producers between a day after the end of August, 1934, appointed by the Ministers and the 31st March, 1935. Such payments shall, in the case of a live animal, be an amount computed on the weight of the animal at the time of certification at a rate not exceeding 5*s*. per cwt.; and, in the case of a carcase, an amount computed on the weight of the carcase not exceeding 9*s*. 4*d*. per cwt. No certificate may be granted where the animal has been castrated after the age of 9 months, or is in milk, or is more than 5 months advanced in pregnancy. In the case of an imported animal it must be shown that it has been in the United Kingdom for a continuous period of at least three months. In the case of a carcase the carcase must be dressed in accordance with regulations to be made by the Ministers. By Section 3 orders are to be made by the Ministers providing for the marking of imported cattle. Penalties are provided for infringement of such orders or alteration of marks placed on imported cattle. By Section 4 a Committee (known as "the Cattle Committee") is to be appointed by the Ministers to advise them and prepare arrangements for their sanction. By Section 5 a person whose business it is to keep cattle in the United Kingdom for the purpose of selling them in an improved condition is to be taken to be a producer of cattle; a "cow-heifer" means any bovine animal which has calved but has not grown more than six permanent

incisor teeth; and cattle removed from the Isle of Man into the United Kingdom are to be deemed to be imported into the United Kingdom.

II.—Cases in the Courts.

1. *Labour.*—In *Coughlan* v. *Sheehan* (1933, W.C. and I. Rep. 399), where a domestic servant living in a farmhouse was seized with a fit when resting seated in a chair beside an open hearth fire, and, as a result, fell into the fire and was seriously injured, it was held that the employment was continuous and that the accident arose out of, and in the course of, the employment. This was a decision in the Irish Free State.

There are several cases on Workman's Compensation, but in no other does the workman appear to have been employed in connection with agriculture. In *Williams* v. *Smith* (1934, 2 K.B. 158; 103 L.J. K.B. 421) the Divisional Court held that where a person employs a workman in agriculture and pays him the full minimum wages fixed by the Act and does not require him to live in the employer's house, but by an independent bargain permits him to do so on condition of the workman paying for board and lodging a sum in excess of that at which board and lodging may be calculated where the employer supplies them, he is guilty of an offence under Section 7 (7) of the Agricultural Wages (Regulation) Act, 1924.

2. *Landlord and Tenant.*—There have been important decisions under this head, which may affect agricultural holdings. In *Hanson* v. *Newman* (1934, 1 Ch. 298; 103 L.J. Ch. 124) the Court of Appeal (affirming Luxmoore J.) held that, where landlords obtained forfeiture and possession of leasehold premises on the ground of breach of covenant to repair, the tenant could not set off against the claim for damages the difference between the value of the premises at the date of re-entry and the value of the reversion if the lease had not been determined; but that the measure of damage was the diminution in value of the premises by reason of neglect to repair.

In *Wilchick* v. *Marks* (1934, 2 K.B. 56; 103 L.J. K.B. 372) Goddard J. held that the landlord of premises, who had reserved to himself the right to enter and repair the premises, was (as well as the tenant) liable to a third party for an injury to her when walking along the highway caused by the fall of a defective shutter, the condition of which he was aware of, although neither he nor the tenant were under any contractual liability to repair. In *O'Connor* v. *Brewin* (1933, 1 K.B. 20; 101 L.J. K.B. 706), noted in the article on Contemporary Agricultural Law in this Journal for 1933, the Court of Appeal held that when a claim is made under s. 12 of the Agricultural Holdings Act, 1923, for loss

or expense exceeding one year's rent of the holding, particulars of such loss and expense must be given under Sect. 16 subs. 2 of the Act within two months of the termination of the occupation, otherwise the claim will fail. It was uncertain after this decision whether any such particulars need be given when the loss or expense does not exceed one year's rent and nothing more is claimed. But this doubt has now been removed by the Court of Appeal in the case of *Spreckley* v. *Leicestershire County Council* (1934, 1 K.B. 366; 103 L.J. K.B. 200) in which it was held that where compensation for disturbance is claimed by the tenant of an agricultural holding, particulars of loss sustained through quitting must be given under S. 16, subs. 2, of the Agricultural Holdings Act, 1923, even where only one year's rent is claimed as such compensation, and a mere claim of one year's rent is not sufficient particulars; and that a notice that such a claim will be made does not constitute such particulars. In *Turton* v. *Turnbull* (1934, 2 K.B. 197; 103 L.J. K.B. 598) it was decided by the Court of Appeal that, where notice to quit an agricultural holding is given for any of the reasons for which it may be given without rendering the landlord liable for compensation for disturbance, such reasons may be stated in a covering letter sent with the notice to quit.

Rugby School (*Governors*) v. *Tannahill* (1934, 1 K.B. 695; 103 L.J. K.B. 398) was a case where the lessee of premises committed a breach of her covenant not to use the premises for illegal or immoral purposes. It was held (1) that the breach was not remedied by ceasing to commit the breach, (2) that, being incapable of remedy, the landlords need not require it to be remedied in their notice to quit given under Section 146 of the Law of Property Act, 1925, (3) that the landlords need not ask for compensation in the same notice, if they do not desire it; and hence that the notice was good. In *Simpson* v. *Charrington & Co.* (1934, 1 K.B. 64; 103 L.J. K.B. 48) it was held by the Court of Appeal that, notwithstanding Section 4 subs. 1 (*c*) of the Landlord and Tenant Act, 1927, the tenant of Licensed premises could claim compensation for goodwill even where the sole trade carried on was the sale of intoxicating liquors.

Hiller v. *United Dairies* (*London*), *Ltd.* (1934, 1 K.B. 57; 103 L.J. K.B. 5) was an important case where it was held that the Rent Restriction Acts protect only tenants who are personally in occupation and whose occupation is of a domestic character; companies are therefore not protected by it.

3 *Tithe Rentcharge.*—Cases under this head are important while the obligation to pay tithe rentcharge remains as at present.

In *Queen Anne's Bounty* v. *Thorne* (1934, 2 K.B. 175; 103 L.J. K.B. 473) the Court of Appeal, reversing the decision of the Divisional Court on this point (referred to in the last year's Article on Agricultural Law in this Journal at p. 402), held that the obligation to give ten days' notice of intention to distrain imposed by Section 81 of the Tithe Act, 1836, is not imported into Section 2, subs. 2, of the Tithe Act, 1891, so as to require the officer appointed to distrain to give that notice before levying a distress. In *Queen Anne's Bounty* v. *Blacklock's Executors* (1934, 1 K.B. 599; 103 L.J. K.B. 183) it was held that the limitation of distress for tithe rentcharge to two years' arrears contained in Section 81 of the Tithe Act, 1836, refers to *quantum* only and that, provided proceedings for recovery have been commenced within two years from its becoming due under Section 10 (2) of the Tithe Act, 1891, distress may be levied for tithe rentcharge which became due more than two years before the distress. That an order for distress for arrears of tithe rentcharge is not invalid by reason of its referring to lands in two or more parishes, was held in *Queen Anne's Bounty* v. *Cooke* (50 T.L.R. 339). In *Swaffer* v. *Mulcahy* (1934 1 K.B. 608; 103 L.J. K.B. 347) it was held that sheep and beasts of the plough can be seized under a distress for tithe rentcharge whether there is or is not other distress available, and the right is not limited in this respect as in the case of distress for rent.

4. *Rates and Taxes.*—In *Egyptian House* v. *Maynards, Ltd.* (50 T.L.R. 367) the lessors of certain premises let at £550, but sub-let at higher rents and assessed for income tax at £730, claimed that the lessees were bound to deduct £47 10*s.* being the "just proportion" of an allowance under a covenant to execute repairs, from the quarterly instalment of rent before deducting income tax thereon and that income tax could only be deducted from the balance. It was held that the lessees were entitled to deduct income tax from the full amount of the rent. The repairs allowance is to be deducted from the tax and not from the rent.

In the Scottish case of *Inland Revenue Commissioners* v. *Wilson's Executors* (1934, Sc. L.T. 188) it was held that sums paid for compensation for disturbance and the legal expenses of a tenant in connection with the compromise of an action against him could not be allowed as "costs of management."

In *Elliott* v. *Barn* (1934, 1 K.B. 109; 103 L.J. K.B. 1) the owners of surface lands (who had leased the surface to a farmer) granted liberty to persons working the minerals to let down the surface in consideration of a yearly rent and royalties. It was held that these payments were not liable to income tax as they were the result of an agreement deterring the surface owners from exercising their rights to restrain the letting down of the surface.

Smith v. *York Race Committee* (1934, 1 K.B. 517; 103 L.J. K.B. 578) was a case under the Income Tax Act, Schedule I, where it was held that the paddocks, lawns and enclosures used for the business of racecourse proprietors were not so closely connected with the buildings (stands, stables, weighing-room, etc.) used for the same business as to be exempt from income tax under Schedule B.

5. *Produce.*—In *Paul, Ltd.* v. *Wheat Commission* (78 S.J. 413; 50 T.L.R. 408) it was held that the question under Section 20 of the Wheat Act, 1932, whether middlings are offal or flour subject to quota payment is, if they are intended for animal or poultry food, a question of fact. By-law 20 of the Wheat By-Laws, 1932, is *ultra vires* so far as it attempts to oust the jurisdiction of the Court.

In the article on Contemporary Agricultural Law in this Journal for 1933 the case of *Walley* v. *United Dairies* (*Wholesale*), *Ltd.* (77 S.J. 251) is cited in which it was held that the defendants were not entitled to deduct from the monthly price of milk a sum in excess of the actual sum paid by them for the railway carriage to London after deductions and rebate allowed by the railway company in consideration of the large quantity of milk consigned to them. This case has since been reversed by the House of Lords and the purchasing company held entitled to make the deductions in question.

Rex v. *Milk Marketing Board*; *ex parte North* (50 T.L.R. 559) is an important case under the Agricultural Marketing Act, 1931. In that case the Milk Marketing Board established under the *Milk Marketing Scheme* (*Approval*) *Order*, 1933, imposed a fine of £50 on W. J. North, a registered retailer of milk in the Aldershot District, for selling his milk below the prevailing price in his district. It was alleged that the price for the district had been fixed at 6*d.* a quart and that he had undersold at 5*d.* a quart. On a rule for a *certiorari* to bring up and quash the resolution imposing the penalty, the Divisional Court held (1) that the Board was a body to which *certiorari* would lie and (2) that the rule must be made absolute on the ground that the retailer had not been given a fair opportunity of replying to the charge against him.

5. *Miscellaneous.*—In *Knott* v. *London County Council* (1934, 1 K.B. 126; 103 L.J. K.B. 100) the facts were as follows: A cleaner employed at a school by the County Council was bitten and injured while engaged in her duties by a dog owned by the school caretaker. It was a condition of the caretaker's employment that he was permitted to have a dog but in that case he must see that it was under proper control. The County Court

Judge found that the caretaker knew that the dog was prone to attack mankind, but the evidence was that he had not communicated this knowledge to his employers. The Court of Appeal held that the plaintiff had failed to prove that the animal was the Council's dog or kept by them or that they had actual or imputed knowledge of its savage propensity. It was not the caretaker's duty to keep a dog nor was it incidental to that duty. The knowledge of the servant could only be imputed to the master when acquired in the course of the servant's employment. Consequently the action failed. The same decision was given in the County Court and the Divisional Court but on the ground of common employment.

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AGRICULTURAL STATISTICS, 1934.

THE following table gives a summary of the acreages of crops and grass, and numbers of live stock returned by occupiers on June 4th, 1934, together with the corresponding figures for 1933.

Under crops there was a further increase of 6 per cent. in the acreage devoted to wheat, following an increase of 29 per cent. in the previous year. The barley crop increased by more than 14 per cent., thus making good about half the reduction which was recorded in 1933. Oats showed a further decline of 6 per cent.

The potato area was smaller by some 31,000 acres, or 6 per cent. The acreage of turnips and swedes suffered a further reduction, and at 520,000 was almost exactly half that of twenty years ago. Sugar beet was grown on 396,500 acres, an increase of nearly 9 per cent. and easily a record for the country.

Most of the vegetable crops showed notable increases, ranging from 3 per cent. for celery to 12 per cent. for brussels sprouts and no less than 28 per cent. for carrots. Both small fruit and orchards showed slight expansions of acreage.

In regard to cattle, the dairy herd created a new record with an increase of about 40,000 head, and other cattle, two years old and over, increased by more than 4 per cent. On the other hand, the depressing outlook for beef is reflected in the smaller number of calves reared, the figure falling by 57,000 or 4·4 per cent.

There was a fall in the number of breeding ewes of something approaching half a million, and this was reflected in the fall of over 5 per cent. in the total lamb crop. The number of yearling sheep, chiefly, of course, the material for maintaining the ewe flocks, showed a serious fall of over 28 per cent.

Pigs showed an all-round increase, the total figure being up by 8 per cent., and at 3,319,000 just exceeded the previous record number, which was recorded in 1924.

Horses in work showed a further decrease, but the revival in breeding continued, the number of foals increasing by 6 per cent.

ACREAGE UNDER CROPS AND GRASS AND NUMBERS OF LIVE STOCK ON HOLDINGS ABOVE ONE ACRE IN EXTENT IN ENGLAND AND WALES AS RETURNED BY OCCUPIERS ON JUNE 4TH, 1934, AND JUNE 3RD, 1933.

(*The figures for* 1934 *are subject to revision.*)

Distribution.	1934[2].	1933.	Increase (+) or Decrease (−).
	Acres.	Acres.	Acres.
Total Acreage under all Crops and Grass	25,025,000	25,120,000	− 95,000
Rough Grazings[1]	5,424,000	5,398,000	+ 26,000
Arable Land	9,248,000	9,250,000	− 2,000
Permanent Grass for Hay	4,822,000	4,604,000	+ 218,000
" " not for Hay	10,955,000	11,266,000	− 311,000
Wheat	1,759,000	1,660,000	+ 99,000
Barley	861,000	751,000	+ 110,000
Oats	1,401,000	1,495,000	− 94,000
Mixed Corn	96,300	104,500	− 8,200
Rye	18,400	19,800	− 1,400
Beans, harvested as corn	134,500	139,100	− 4,600
Beans, picked or cut green	16,700	14,300	+ 2,400
Peas, harvested as corn	68,700	72,600	− 3,900
Peas, picked or cut green	74,300	63,700	+ 10,600
Potatoes	487,500	518,900	− 31,400
Turnips and Swedes	520,200	555,200	− 35,000
Mangold	246,200	238,100	+ 8,100
Sugar Beet	396,500	364,100	+ 32,400
Cabbage for Fodder, Kohl Rabi and Rape	136,900	117,600	+ 19,300
Vetches or Tares	52,500	53,300	− 800
Lucerne	34,200	34,800	− 600
Mustard for Seed	17,100	16,500	+ 600
Cabbage for human consumption	37,000	33,100	+ 3,900
Brussels Sprouts	34,100	35,900	− 1,800
Cauliflower or Broccoli	20,100	20,700	− 600
Carrots	16,500	12,900	+ 3,600
Onions	2,100	1,900	+ 200
Celery	7,500	7,300	+ 200
Rhubarb	8,100	8,200	− 100
Linseed	1,000	1,100	− 100
Hops	17,800	16,900	+ 900
Small Fruit	61,100	60,000	+ 1,100
Orchards	254,700	249,600	+ 5,100
Clover and Rotation Grasses for Hay	1,289,000	1,261,000	+ 28,000
Clover and Rotation Grasses not for Hay	783,000	813,000	− 30,000
Bare Fallow	340,000	458,000	− 118,000
	No.	No.	No.
Horses used for Agricultural purposes (including Mares for Breeding)	596,200	645,600	− 49,400
Unbroken Horses (including Stallions) — One year and above	88,700	84,600	+ 4,100
Unbroken Horses (including Stallions) — Under one year	43,800	41,200	+ 2,600
Other Horses	156,800	131,200	+ 25,600
TOTAL OF HORSES	885,000	902,600	− 17,100
Cows and Heifers in Milk	2,213,600	2,179,000	+ 34,600
Cows in Calf but not in Milk	363,900	358,200	+ 5,700
Heifers in Calf	417,200	418,000	− 800
Other Cattle — Two years old and above	1,042,000	996,400	+ 45,600
Other Cattle — One year and under two	1,368,200	1,356,900	+ 11,300
Other Cattle — Under one year	1,254,100	1,311,700	− 57,600
TOTAL OF CATTLE	6,659,000	6,620,200	+ 38,800
Ewes kept for Breeding	7,302,700	7,767,900	− 465,200
Other Sheep — One year and above	1,731,600	2,424,000	− 692,400
Other Sheep — Under one year	7,483,400	7,898,000	− 414,600
TOTAL OF SHEEP	16,517,700	18,089,900	−1,572,200
Sows kept for Breeding	449,900	405,600	+ 44,300
Other Pigs	2,869,000	2,663,500	+ 205,500
TOTAL OF PIGS	3,318,900	3,069,100	+ 249,800

[1] Mountain, Heath, Moor, Down and other rough land used for grazing.
[2] Subject to revision.

THE LONDON QUARANTINE STATION.

On March 31st, 1934, this Society handed over to the Ministry of Agriculture and Fisheries the control and management of the Livestock Quarantine Station at East India Docks, London. The Society took the initiative in securing the establishment of this Station, and was responsible for its administration during the first six years of its existence. It has therefore been thought fitting shortly to record the history of the movement and the experience of the Society in carrying on the work.

It is well known that, despite the relatively fortunate position of Britain with regard to the incidence of animal disease, the export trade in pedigree livestock has been liable to serious interruption by reason of the occurrence of sporadic outbreaks of foot-and-mouth disease. The object of the quarantine scheme was, therefore, to provide machinery that would enable animals to be exported, with a clean bill of health, even when foot-and-mouth restrictions were in force in particular areas of the country. Naturally, the machinery had fully to satisfy any conditions laid down by the importing countries, as the success of the scheme depended entirely on the confidence in it of these countries.

As early as 1923 a Joint Committee was formed to draft livestock export regulations which might prove acceptable to the Dominions and Colonies, the bodies represented being the National Cattle, Sheep and Pig Breeders' Associations and the R.A.S.E. This Committee met in 1924, but foot-and-mouth disease was then quite exceptionally widespread in this country and it was decided to leave any practical steps until a more opportune time.

In November, 1926, it became known that the Government of the Union of South Africa was allowing the importation of cattle from Holland while animals from this country were being refused. Sir Merrik Burrell was therefore asked by the Society's Veterinary Committee to enquire into the circumstances and to discover what steps would require to be taken in order to induce the Union Government to open its ports to British stock. After various negotiations the then Minister of Agriculture, Mr. Guinness, asked Sir Merrik to convey to the Society the suggestion that it should prepare a scheme for the institution of quarantine stations, the Minister undertaking, on his part, to recommend the scheme, if approved, for financial support by the Empire Marketing Board. A Sub-Committee of the Royal Agricultural Society of England was accordingly formed and, in May, 1927, submitted a scheme and estimates for the establishment of stations at London, Liverpool and Glasgow.

Later in the same year, when the Empire Marketing Board and also the Governments of the Union of South Africa and of Southern Rhodesia had signified their approval, it was decided to proceed with the first Station at London Docks. It was hoped that the Governments of other Dominions and Colonies would follow the lead of South Africa as soon as it had been demonstrated that the Station was adequately performing its function, viz., that of removing all risk that a diseased animal should be allowed to leave this country. Under the scheme the R.A.S.E. undertook to establish and run the Station; the Ministry to arrange daily veterinary inspection and the issue of health certificates; and the Empire Marketing Board to furnish the capital required and to meet maintenance charges up to a maximum of £3,250 per annum.

The first problem was to secure a site for the station which would expose the animals to a minimum of risk of infection either during their period of quarantine or in the course of their conveyance on board ship. The actual site secured was ideal from this point of view, being almost surrounded by water, miles removed from the nearest farm, and also distant from any wharf where disease-contaminated goods might be handled. A lease was arranged with the Port of London Authority and work was begun in December, 1927. The construction and equipment of the Station were completed, at a total cost of £6,477, in March, 1928; and on April 4th it was officially opened by the Dominions Secretary, Mr. Amery. Mr. Alexr. Ritchie was appointed Manager, with a staff of four assistants, and the administration was placed in the hands of Mr. Turner, the Secretary of the R.A.S.E.

The machinery of quarantine was governed from the outset by the Quarantine Stations (Regulation) Order, 1928, of the Ministry of Agriculture. Its chief provisions were (1) that no animal was to be eligible for admission unless it came from premises outside a radius of fifteen miles from any place on which foot-and-mouth disease (or cattle plague or pleuro-pneumonia) had existed during the previous three months; (2) that all animals must be examined, at the premises of origin, a few days before the date fixed for their admission, by a Veterinary Inspector of the Ministry, and must be certified by him to be free from any of the aforementioned diseases; (3) that any animal suffering from ringworm, mange, lice or any form of contagious or parasitic disease must be refused admission and (4) that all cattle must, before admission, have passed the tuberculin test and any other tests prescribed by the Government of the importing country. The test charts and export certificates, as well as an insurance policy covering the risk of a foot-and-mouth outbreak in the Station, must be produced for inspection.

Other regulations laid down certain precautions in connexion with the disinfection of conveyances used in the transport of stock to the station; provided for the daily inspection of all quarantined animals by the Veterinary Inspector of the Ministry; and prohibited access to the Station of all persons except the regular staff and the Veterinary Inspector.

The accommodation of the Station consists of forty-six separate compartments—large and small boxes and stalls. The highest number of animals ever accommodated (during the fourth quarantine period) has been 104, consisting of 10 cattle, 62 sheep and 32 pigs. The average number has been about 60 or 70 head. At the time of the opening of the Station there was an accumulation of animals awaiting export and there was, in consequence, some congestion and delay. After the first four or five periods, however, the capacity of the Station was found to be meeting all requirements and in 1929 the idea of proceeding with other stations was abandoned.

The normal period of quarantine has been fourteen days but in certain cases the Governments of importing countries have required somewhat longer periods.

As was hoped, a large number of overseas countries approved the scheme and have since accepted stock through the Station. The Irish Free State intimated its acceptance in June, 1928, Australia in March, 1929, and Canada in 1932. New Zealand has received a few cattle through the Station, but has so far insisted on an additional quarantine, of three months' duration, at Hobart, Tasmania. This regulation raises the cost of export to New Zealand to a very high figure. Small consignments of stock have been passed through for Antigua, Cyprus, Palestine, Trinidad, &c., and in such cases it has been found convenient to admit stock for more than one destination in a given quarantine period. All the animals enter the Station on the same day and are shipped to their respective countries as soon after the expiry of the minimum regulation period of detention as sailings are available.

The Empire Marketing Board continued to make financial provision for the work of the Station up till September 30th, 1933, on which date the Board's activities ceased. The Ministry of Agriculture then became responsible for the financial indemnity in regard to the Station, but, since no Government funds were available for the purpose, the Society was asked to give notice to terminate the tenancy of the Station as at 25th December, 1933. The Ministry, however, acknowledged that the closing of the Station would be a calamity, and offered to consider sympathetically any proposal that might make possible its continuance.

Representatives of the Breed Societies met at the Ministry in November, 1933, and a Sub-Committee was appointed to consider how, through possible economies in administration and the increase in the quarantine fees, the Station could be made self-supporting. Meanwhile this Society was asked to remain in control. The Sub-Committee's recommendations were that the administration of the Station be transferred to the Ministry and that the fees be increased and consolidated according to the tables set out below :—

Original Fees.

Ministry's Inspection Fee . . . . £2 10*s*.

in respect of each separate consignment of one or more animals from the same premises.

Care and Maintenance (for quarantine period of 14 days)—

Cattle	£3 per head	Increased *pro rata* if period of 14 days is exceeded.
Sheep	£1 ,, ,,	
Pigs	£1 ,, ,,	
Goats	£1 ,, ,,	

Transfer Charges to Export Steamer—

Cattle	5*s*. per head.	
Sheep	2*s*. 6*d*. ,, ,,	
Pigs	5*s*. ,, ,,	(in crates).
Goats	2*s*. 6*d*. ,, ,,	

Amended Fees.

General Fee—

	1 Animal.			Each other animal from the same premises of origin.			Excess of 14 days per head per day.		
	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
Cattle	6	15	0	4	5	0	0	7	0
Pigs	4	0	0	1	10	0	0	2	6
Sheep or Goats	3	10	0	1	0	0	0	1	6

Value Fee—

(Based on Insurance value of animal in Quarantine Station)—

Per Head.	Per Head.	Maximum Value Fee per Head.
Cattle, £100 or over	2 per cent. of value	£10
Pigs, £40 or over	1 ,, ,, ,,	£1
Sheep, £30 or over	1 ,, ,, ,,	£1
Goats, £30 or over	1 ,, ,, ,,	£1

Transfer Charges to Export Steamer.—To remain as before.

The Royal Agricultural Society duly gave notice to the Port of London Authority terminating the tenancy of the Quarantine Station premises by the Society on March 25th, 1934, and the actual transfer to the Ministry of Agriculture and Fisheries took place on March 31st, 1934.

In order that no delay or inconvenience should be experienced by exporters the Society fixed quarantine periods up to the end of May, 1934, the Ministry dealing with the applications for the steamers concerned.

At the end of March, 1934, the Society had administered the Quarantine Station for six complete financial years, in which there had been 85 quarantine periods, and the following statement shows the number of animals quarantined and shipped during that time.

Year Ending—	Cattle.	Sheep.	Pigs.	Goats.	Total.	Insurance Value.
						£
March 31, 1929 .	347	126	60	10	543	31,594
„ 31, 1930 .	387	192	109	5	693	61,915
„ 31, 1931 .	204	339	49	4	596	28,321
„ 31, 1932 .	140	51	37	3	231	18,391
„ 31, 1933 .	115	169	12	5	301	15,961
„ 31, 1934 .	179	131	20	2	332	27,916
Total . .	1,372	1,008	287	29	2,696	£184,098

TOTAL NUMBERS OF ANIMALS EXPORTED TO RESPECTIVE COUNTRIES FOR SIX YEARS ENDING MARCH 31, 1934.

—	Cattle.	Sheep.	Pigs.	Goats.	Total.
Australia	402	229	78	—	709
Tasmania, *via* Australia .	—	26	—	—	26
New Zealand, *via* Australia .	—	41	—	—	41
„ „ „ Hobart .	2	—	—	—	2
Antigua	2	2	—	—	4
Barbados	—	—	—	2	2
Canada	11	14	5	—	30
Cyprus	2	—	—	—	2
Gold Coast	—	—	6	2	8
Irish Free State . . .	143	169	104	—	416
Northern Ireland . . .	—	—	—	2	2
Northern Nigeria . . .	—	2	—	—	2
Northern Rhodesia . .	20	—	—	—	20
Southern Rhodesia . . .	225	2	10	—	237
Palestine	11	8	4	4	27
South Africa	509	515	76	16	1,116
South West Africa . . .	42	—	—	—	42
Trinidad	3	—	4	3	10
	1,372	1,008	287	29	2,696

Out of the annual grant of £3,250 provided for by the Empire Marketing Board, the Society found it necessary to call for only the following amounts, to meet the cost of the administration,

after retaining the Fees (including the Ministry's Inspection fees).

	£ s. d.	£ s. d.
Year ending—		
March 31, 1929	770 0 0	
„ 31, 1930	150 0 0	
„ 31, 1931	750 0 0	
„ 31, 1932	1,305 0 0	
„ 31, 1933	820 0 0	
„ 31, 1934	925 0 0	
		4,720 0 0
Less refunded to Ministry as not required—		
March, 1929	150 0 0	
„ 1930	150 0 0	
„ 1934 . . . . about	40 0 0	
		340 0 0
		£4,380 0 0

Out of the 85 Quarantine periods, there were 23 when the Station was either filled to capacity, or practically full. In some cases the steamers could not take all the animals that might have been accepted by the Station, but any surplus was soon disposed of.

In the latter part of 1931 the freight subsidies arranged between the Empire Marketing Board and the Dominion and Colonial Governments were discontinued and this, coupled with the general trade depression, led to a decline in shipments during 1932 and 1933. The better trade outlook from the end of 1933 was reflected in a much larger entry to the Station. From April to September, 1933, only 120 animals were admitted but in the following six months the number was 212, making a total of 332 as against 231 and 301 in the two preceding years.

Throughout the six-year period the administration ran very smoothly on the whole, though there were naturally many minor difficulties to be overcome. Sometimes sailings were unavoidably delayed, occasionally animals failed to pass tests, entries had to be cancelled on account of foot-and-mouth outbreaks and shipments to the Station from the Channel Islands were sometimes delayed by bad weather. During the whole period nine animals died or were slaughtered on account of illness; in one case only was the disease of a parasitic or contagious character (mange). In no case did it happen that an animal arrived at the Station after the date fixed as the beginning of its quarantine period, and in no case did an animal miss shipment unless on account of illness.

All concerned with the Station have worked loyally and harmoniously for its success, and this Society acknowledges with gratitude the sympathetic co-operation of the Empire Marketing Board, the Ministry of Agriculture and Fisheries and the Port of London Authority.

THE IPSWICH SHOW, 1934.

It may be remembered by readers of the Journal and Members of the Society that the Corporation of Ipswich sent a deputation to London to tender an invitation to the Society to hold the Show of 1907 in their district, which invitation was at that time declined in favour of one from the City of Lincoln; and not until a year or two ago did the Suffolk County Town again approach the Society suggesting that Ipswich might be selected as the venue of the great national agricultural gathering for 1934. On this occasion the invitation was most cordially accepted.

Never, probably, in the history of the Society has the Council been favoured with more useful and practical local co-operation than they received in connection with this Show.

All those interested, not only in Suffolk but also in the adjoining counties of Norfolk and Essex, resolved to make the 93rd Royal Agricultural Show a memorable one, and all will agree that their efforts were successful beyond the most sanguine expectations.

To the Suffolk Agricultural Association, the Royal Norfolk Agricultural Association and the Essex Agricultural Society, the R.A.S.E. are much indebted. Their officials co-operated wholeheartedly in the work of the Ipswich Local Committee, and all three bodies agreed to give up their own annual exhibitions. In return, privileges were granted to the members of the County organisations similar to those enjoyed by members of the parent Society.

The only previous "Royal" in Suffolk took place at Bury St. Edmunds in the year 1867, following the first break in the continuity of the series of annual shows. This break was due to the disastrous cattle plague which ravaged the country after the Society's Show held in 1865. Preparations had apparently been made for the Show of 1867 on the usual lines, but, under a Privy Council ban, and to the disappointment of every one concerned, the Society was reluctantly compelled to abandon the Cattle section at Bury.

The site of the show yard on the London—Colchester—Ipswich Road was about two miles from the town. It was 80 acres in extent and was secured by the Corporation of Ipswich from the late Major Eustace Quilter for the purpose of the Show on most favourable terms. Some three years ago most of the site was arable land, but as soon as the negotiations

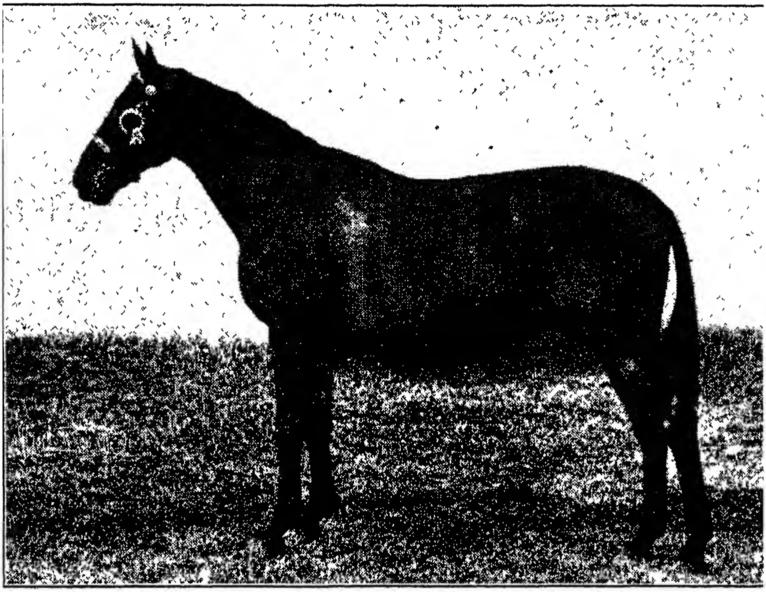

FIG. 1.—HUNTER MARE, "THE BINT."
Winner of Champion Prize for best Hunter Mare, Ipswich, 1934.
Exhibited by MR. H. R. W. MITCHELL.

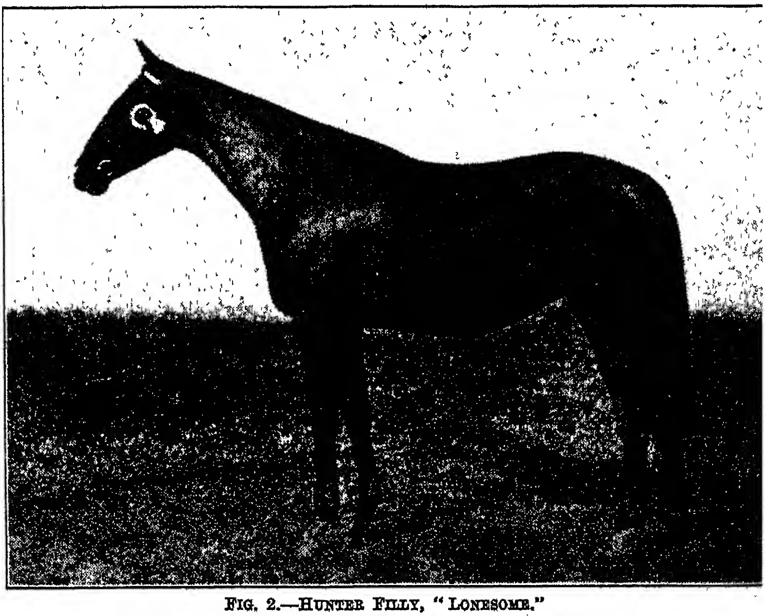

FIG. 2.—HUNTER FILLY, "LONESOME."
Winner of Champion Prize for best Hunter Filly, Ipswich, 1934.
Exhibited by MR. H. HINDLEY.

for its acquisition were complete it was seeded down to grass. Some fear was expressed that, owing to the variable seasons and particularly the dry summer of 1933, the turf would not be quite up to what is expected in a Royal Showyard. Much care and attention were paid to the growing crop by experts loaned by Messrs. Fisons and Messrs. Ransomes, Sims & Jefferies of Ipswich, and they are to be congratulated on the success of their work and supervision.

The Large Ring, to which special care had been devoted, withstood the wear and tear of the many events taking place therein during the five days of the Show remarkably well. The lay-out was on the usual lines but was, when all the exhibits were in position, very compact; in fact, in the Implement Section, where entries were large, the phrase "crowded to capacity" would apply.

The levelling, preparation of the ring, laying on of gas, water and electricity, was undertaken by the Local Committee and the Ipswich Corporation under the personal supervision of the Borough Engineer, Mr. McLaughlan, who gave a considerable amount of his time to this.

An extension of the Borough water-supply mains from the boundary point on the Ipswich Road had to be laid to provide the supply required. Exhibitors and visitors all expressed their pleasure at the fact that there was only one entrance to the Show and that the Car Park was so near and convenient.

The Corporation of Ipswich had obtained powers to extend their trolley bus service on the Ipswich—Colchester Road and took advantage of the visit of the Royal Show to accelerate the work, so that they might have a regular service running on the extended route in time for the Show. The Traffic Commissioner for the Eastern District was very helpful in granting licences to 'bus and coach owners who desired to run special services to the Show.

The following figures show the number of private cars parking each day in the Show Parks which were again efficiently managed by the Royal Automobile Club.

Tuesday, 3rd July	2,589
Wednesday, 4th July	4,662
Thursday, 5th July	4,354
Friday, 6th July	2,181
Saturday, 7th July	1,202
	14,988

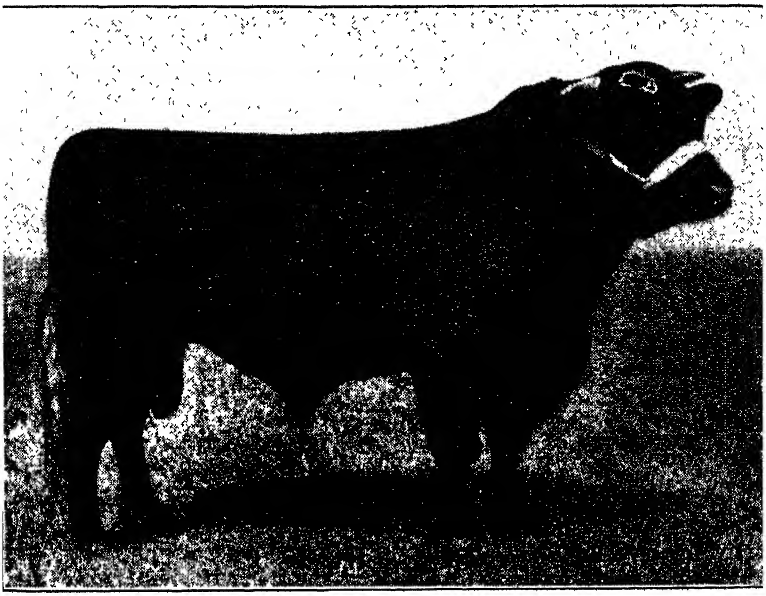

FIG. 3.—LINCOLNSHIRE RED SHORTHORN BULL, "SEAHOLM BOBLETT."
Winner of Champion Prize for best Lincolnshire Red Shorthorn Bull, Ipswich, 1934.
Exhibited by MR. E. S. TANSLEY.

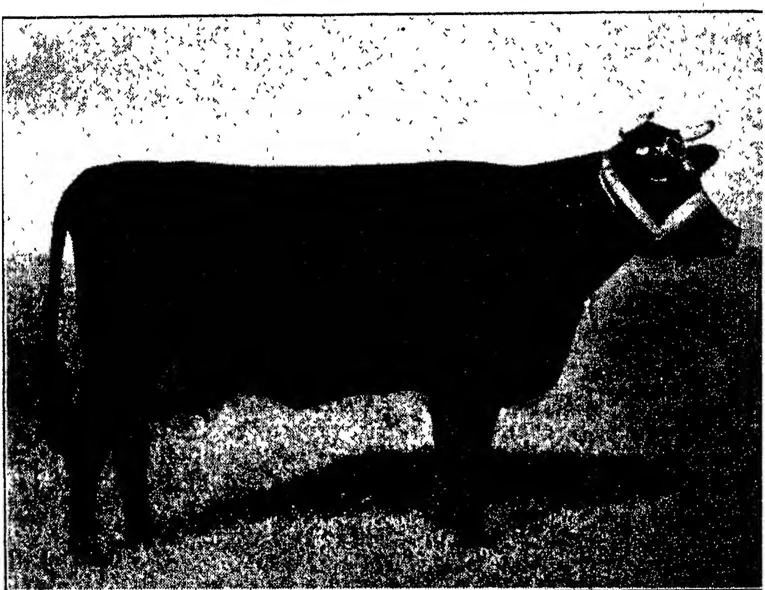

FIG. 4.—LINCOLNSHIRE RED SHORTHORN COW, "HISTON ACACIA 5TH."
Winner of Champion Prize for best Lincolnshire Red Shorthorn Cow or Heifer, Ipswich, 1934.
Exhibited by MESSRS. CHIVERS & SONS, LTD.

The Royal Automobile Club again rendered most helpful service in "signing" the roads leading to the Show and in preparing for the use of members and visitors a coloured map defining the roads to the Show and the routes to be taken by cars coming from a distance.

New features at the Show this year were light luncheon and refreshment buffets in the Members' Pavilion and the "Press Room."

At the Ipswich Show the value of the prizes offered (cups, medals, champions and specials included) was £15,793. Towards this sum, £1,550 was given from the Local Fund, and the contributions of the various stud-, herd- and flock-book Societies amounted to £3,983.

In the Livestock section the most outstanding classes were those for the local breeds—Suffolk horses, Suffolk sheep, and Red Poll cattle. The exhibits of these three well justified the extended classification, providing a magnificent demonstration of the County's contribution to British pedigree stock-breeding.

An event which excited considerable admiration and favourable comment was the daily parade of teams, with waggons, of heavy draught horses of the Shire, Suffolk and Percheron breeds. The splendid animals in these teams provided a truly wonderful spectacle which will not soon be forgotten by those fortunate enough to see it.

Taken as a whole, the livestock exhibits—large numbers of which were from the immediate neighbourhood—made a most creditable show, and breeders and exhibitors are much to be congratulated on it.

The only sections cancelled through lack of entries were those for Welsh ponies and Welsh cattle, Galloway cattle and Cheviot sheep.

Classes for Bacon Pigs and Porkers were again included in the prize schedule, and were well supported. On this occasion it was made a condition that the pigs entered should, after the show, be slaughtered, so that a report could be made on the carcases. Through the Local Committee champion prizes were offered for (1) the best pen of Bacon Pigs, and (2) for the best two carcases comprising an exhibit in the same classes. For the report on the carcases, reference should be made to page 456.

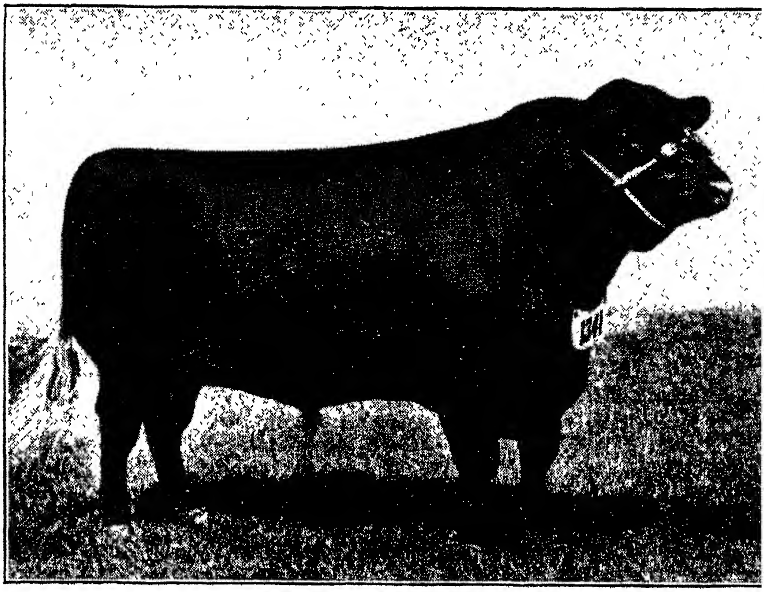

FIG. 5.—RED POLL BULL, "ABBEYCOMBE FABIAN."
Winner of Champion Prize for best Red Poll Bull, Ipswich, 1934.
Exhibited by MR. J. G. GRAY.

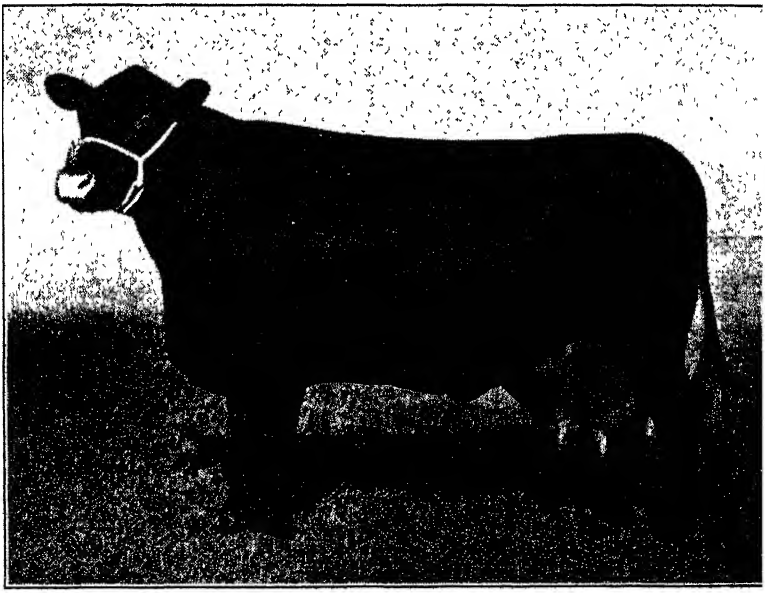

FIG. 6.—RED POLL COW, "KNEPP PRUDENCE 8TH."
Winner of Champion Prize for best Red Poll Cow or Heifer, Ipswich, 1934.
Exhibited by LT.-COL. SIR MERRIK R. BURRELL, BART., C.B.E.

STATEMENT OF ENTRIES FOR THE 1934 SHOW COMPARED WITH PREVIOUS YEARS.

Entries of Live Stock, Poultry and Produce.

	Ipswich, 1934.	Derby, 1933.	Southampton, 1932.	Warwick, 1931.	Manchester, 1930.	Harrogate, 1929.	Nottingham, 1928.	Newport 1927.	Reading, 1926.
Horses .	729*	592*	437*	568*	512*	634*	607*	429*	614*
Cattle .	1,281*	1,149*	1,009*	1,168*	1,164*	1,263*	1,261*	1,214*	1,640*
Goats .	107*	97*	75*	68*	48*	92*	61*	40*	67*
Sheep .	576	573	520	569	735	723	591	524	724
Pigs . .	841	688	551	688	678	691	833	664	986
Total .	3,534	3,099	2,592	3,061	3,137	3,403	3,353	2,871	4,031
Poultry .	792	984	840	741	901	943	1,036	887	1,111
Produce .	269	264	274	253	506	363	365	350	356

* Exclusive of Double Entries.

SHEDDING IN IMPLEMENT YARD (IN FEET).

Description of Shedding.	Ipswich, 1934.	Derby, 1933.	Southampton, 1932.	Warwick, 1931.	Manchester, 1930.	Harrogate, 1929.	Nottingham, 1928.	Newport, 1927.	Reading, 1926.
	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.
Ordinary .	2,240	2,095	1,845	2,190	2,690	2,995	3,035	2,875	3,360
Machinery .	3,530	2,935	2,630	3,690	4,515	4,170	5,466	3,855	4,090
Special . (Seeds, Fertilizers, &c.)	3,176	3,360	2,450	3,083	3,488	3,686	3,501	2,756	3,420
Total . Exclusive of Open Ground Space)	8,946	8,390	6,925	8,963	10,693	10,851	12,002	9,486	10,870
No. of Stands	387	349	311	388	443	431	467	369	446

FIG. 7.—KERRY HILL (WALES) SHEARLING EWES.
Winners of Champion Prize for best exhibit of Kerry Hill (Wales) Sheep, Ipswich, 1934.
Exhibited by MR. JOHN T. BEAVAN.

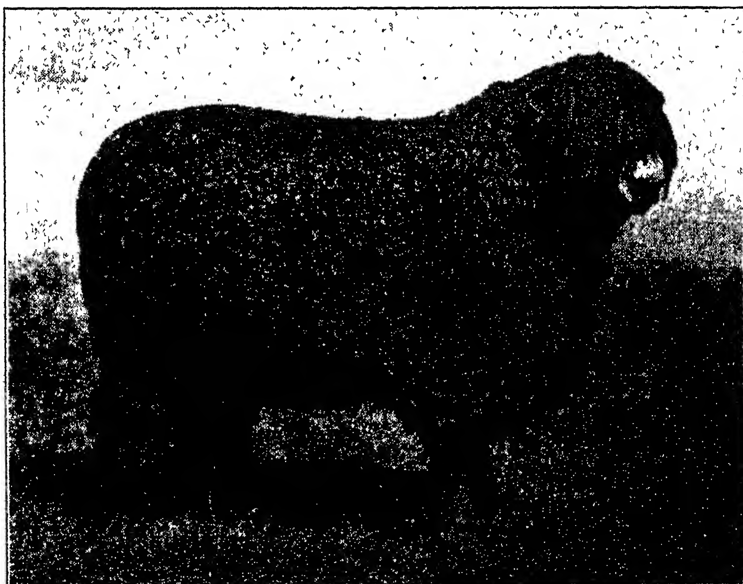

FIG. 8.—LINCOLN SHEARLING RAM.
Winner of Champion Prize for best exhibit of Lincoln Sheep, Ipswich, 1934.
Exhibited by MR. ERNEST ADDISON.

STATEMENT OF ENTRIES, &c.

At Show held at Ipswich in 1934.

Horses, Cattle and Goats.	1934. Classes.	1934. Entries.
HORSES:—		
Prizes		£3,783
Shires	14	130
Clydesdales	5	28
Suffolks	15	265
Percherons	11	58
Hunters—		
Breeding Classes	10	74
Riding Classes	7	123
Polo and Riding Ponies—		
Breeding Classes	5	31
Hack and Riding Ponies	2	12
Arabs	3	12
Welsh Ponies	2	—‡
Children's Ponies	3	35
Driving Classes	9	46
Jumping	5	113
Total for HORSES	91	927*
CATTLE:—		
Prizes.		£6,588
Shorthorn	11	83
Hereford	9	31
Devon	5	27
Sussex	5	19
Welsh	5	—‡
Park Cattle	5	32
Longhorn	4	17
Aberdeen-Angus	6	50
Belted Galloway	4	17
Galloway	4	—‡
Dairy Shorthorn	10	195
Lincolnshire Red Shorthorn	7	43
South Devon	4	20
Red Poll	10	206
Blue Albion	6	22
British Friesian	13	186
Ayrshire	7	76
Guernsey	7	113
Jersey	7	149
Kerry	4	18
Dexter	4	27
Milk Yield	11	127
Butter Test	2	71
Total for CATTLE	150	1,479*
GOATS:—		
Prizes		£140
Inspection Classes	12	107
Milk Yield	2	77
Total for GOATS	14	184*

Sheep, Pigs, Poultry, and Produce.	1934. Classes.	1934. Entries.
SHEEP:—		
Prizes.		£2,149
Oxford Down	5	33
Shropshire	5	31
Southdown	7	82
Hampshire Down	5	36
Suffolk	9	130
Dorset Down	3	14
Dorset Horn	3	11
Wiltshire Horn	3	13
Ryeland	5	23
Kerry Hill (Wales)	5	26
Clun Forest	2	12
Lincoln	5	22
Leicester	4	12
Border Leicester	4	25
Wensleydale	5	26
Kent or Romney Marsh	6	41
South Devon	2	6
Dartmoor	2	8
Devon Close Wool	2	6
Cheviot	2	—‡
Welsh Mountain	2	11
Black Welsh Mountain	2	8
Total for SHEEP	88	576
PIGS:—		
Prizes.		£1,921
Large White	8	203
Middle White	8	121
Tamworth	6	35
Berkshire	8	41
Wessex Saddleback	6	53
Large Black	8	107
Gloucestershire Old Spots	6	31
Cumberland	5	16
Essex	7	114
Long White Lop-Eared	6	28
Welsh	4	15
Bacon Pigs	2	46
Porkers	2	31
Total for PIGS	76	841
POULTRY:—		
Prizes		£410
Entries	122	792
PRODUCE:—		
Prizes		£289
Entries	38	269

Grand Totals for LIVE STOCK, POULTRY, PRODUCE, &c., in 1934 } 579 Classes . 5,068 Entries . £15,793 Prizes.†

* Animals exhibited in more than one class are here counted as separate entries.
† Including £435 for Flower Show, £78 for Butter-Making Competitions.
‡ Classes cancelled under regulation of Prize Sheet.

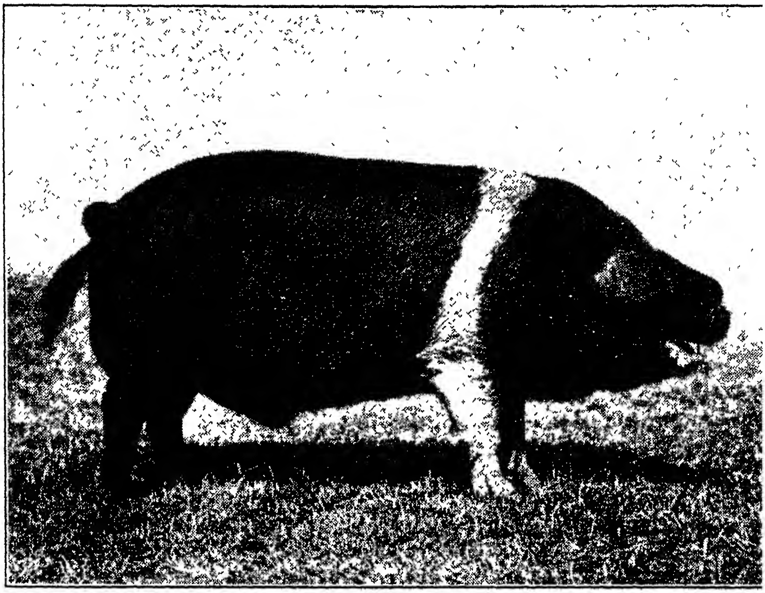

FIG. 9.—WESSEX SADDLEBACK BOAR, "BRANDON DAVID 2ND."
Winner of Champion Prize for best Wessex Saddleback Boar, and Challenge Cup for best Wessex Saddleback Pig, Ipswich, 1934.
Exhibited by MR. FRED W. GENTLE.

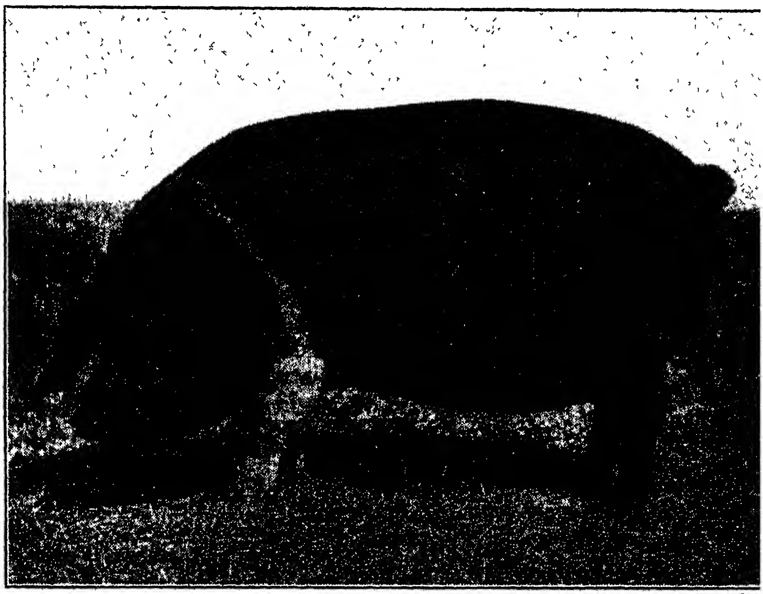

FIG. 10.—WESSEX SADDLEBACK SOW, "PRESTON ORIENT 2ND."
Winner of Champion Prize for best Wessex Saddleback Sow, Ipswich, 1934.
Exhibited by MR. J. W .ROBERTS.

The entries in the Poultry section of the Show were fewer than for the last two years, but there was an added interest this year in the fact that the showyard was the site of a Single Bird Pen Laying Test, organised by Sir Guy Hambling and an expert committee. The test covered twelve lunar months from the 16th October, 1933, to the 16th September, 1934. During the Show the Test Birds, with particulars of their records to date, could be inspected by visitors interested.

Produce entries, though not a large section, were up to the average of the last four Shows.

Details as to classes, prizes and entries are given in the accompanying statements. The list of awards will be found in the Appendix to this volume.

Implements, machinery, feeding stuffs, fertilisers, seeds, &c., shown at Ipswich occupied more space than at any Show since Warwick, and altogether made up a fairly representative collection.

Exhibitors expressed their satisfaction at the amount of direct business done in the showyard and the number of interesting enquiries received, indicating that the prospects for the immediate future in these trades are brighter than they have been for some years.

In co-operation with the Ministry of Agriculture, the Milk Marketing Board arranged a series of demonstrations in view of the contemplated introduction of the Board's Quality Premium Scheme and the qualifications required in connection with the Register of Accredited Producers. Firstly, there was represented a cow shed, milk room and dairy scullery, each equipped with the bare necessities that will enable a producer to supply milk of premium quality; and, secondly, a cow shed, milk room and scullery similar to the first set, but modified and equipped in a manner that makes for efficiency and economy in management through the saving of labour and general convenience of working. There was also a scientific exhibit designed to explain both how and why the recommendations embodied in the demonstration should be carried out, and an enquiry bureau so that visitors might obtain assistance in the solution of their special problems.

A special Trade Display was associated with the demonstration, so arranged as to afford interested producers facilities for comparing the merits and prices of the various types of equipment.

A most valuable Agricultural Education Exhibit and Demonstration was arranged under the auspices of the Eastern Counties Provincial Conference, the central staff at Cambridge University collaborating with the Agricultural Education Authorities of the Eastern counties. There were several novel features in the Exhibit of which perhaps the most noteworthy

was a collection of dairy cattle illustrating the importance of the principle of the "proven bull" in dairy cattle breeding. In connection with the exhibit visits were arranged to the two Agricultural Experiment Stations run by the East Suffolk County Council, and Members who were able to take advantage of the Council's invitation saw some very interesting series of field experiments upon two widely different types of soil.

"New Implements" awarded the Society's silver medal at Ipswich are the subject of a separate report by the Judges, appearing in the later pages of this volume. The Milk Yield and Butter Test Classes are reported on by the Steward of Dairying, and there is also a Report on the Forestry Exhibit.

In spite of the rather unfavourable weather for horticulturists, the Flower Show at Ipswich was one of the finest ever held in the showground, and the tents were thronged daily with thousands of admiring visitors. At the request of the Steward, Sir Arthur Hazlerigg, the Corporation Electricity Department installed electric fans in the tents to assist in their ventilation, so that there was always a current of fresh air passing through the tents, which was appreciated by exhibitors and visitors alike.

Opening on Tuesday, the 3rd July, the Show continued until Saturday, the 7th July, each day being favoured with cloudless skies and blazing sun, tempered by cooling breezes.

In accordance with time-honoured custom, the first day was taken up with the judging of exhibits of livestock, a task that was not completed till the late afternoon. Prominent among the visitors in the showyard were three West African Chiefs, the Sultan of Sokoto, the Emir of Gwandu and the Emir of Kano, who were interested spectators of the judging. In their native dress, they, in turn, were a source of interest to other visitors.

An official visit was paid to the Show on the Wednesday by H.R.H. The Prince of Wales, who came to Ipswich by car from Frinton. On arrival at the Show entrance, shortly before noon, His Royal Highness was met by the Honorary Director (Mr. Roland Burke) and conducted through the Implement section to the Royal Pavilion, where the President (the Earl of Stradbroke), with Members of the Council and Local Committee, were waiting to receive him. Here His Royal Highness inspected a Guard of Honour of the British Legion and Old Comrades' Association.

The Prince honoured the President with his presence at Luncheon in the Royal Pavilion.

His Royal Highness, in the course of a tour of the showyard with Lord Stradbroke, visited the Model Allotment Garden prepared under the Society of Friends' scheme for helping the Unemployed, H.M. the King's exhibits of cattle, the Flower

Show, Forestry Exhibit, the Milk Marketing Board's exhibit, the Working Dairy and stands of local exhibitors. From the Royal box in the Grand Stand His Royal Highness saw the parade of Suffolk horses and the judging of teams of heavy draught horses.

On leaving the Show the Prince consented to drive through the town of Ipswich. This was a change in the programme of arrangements, which gave great satisfaction to the inhabitants.

On the Wednesday, the 13th Annual International Cattle Judging Competition under the auspices of the National Federation of Young Farmers' Clubs was held. England, Wales and Northern Ireland were on this occasion represented. Economic conditions again precluded the presence of teams from Canada and the U.S.A. The Gold Challenge Cup went to the team from Northern Ireland, with the Welsh team runners-up. Cup, medals and certificates were presented by the President of the Society.

The Society's General Meeting took place on Thursday in the Large Tent, when resolutions of thanks were passed to the Mayor (Mr. P. W. Cobbold), the Town Clerk (Mr. A. Moffat), the Corporation and the Local Committee for their efforts in the promotion of the success of the Show. Special mention was made by the Honorary Director and by the Mayor of the great services rendered to the Society and the Local Committee by Mr. C. H. Clarke of the *East Anglian Times*, who undertook the whole of the Press Publicity work at home and on the Continent for a considerable period before the Show, and stimulated a sustained interest in the event until it was assured of success. Thanks were also accorded to the staffs of the Railway Companies for the part they played in the efficient transport and delivery of the exhibits, etc. A report of the proceedings at the meeting appears in the Appendix.

During the Show there were daily competitions for Shoeing Smiths organised by the National Master Farriers' and Blacksmiths' Association; demonstrations of modern methods of marketing organised by the Ministry of Agriculture; Sheep Dipping demonstrations; and lectures on apiculture and bee demonstrations under the auspices of the British Bee Keepers' Association.

In the Forestry section each day there were demonstrations comprising wheel and chair making by workmen from the President's estate at Henham; Wattle Hurdle making; the making of Birch Besoms, Cleft Hurdles, Thatch Pegs, etc.

The Competitions for Horse Jumping were keenly contested. Other ring attractions were the Musical Rides and Trick Riding Displays given by H.M. Royal Horse Guards (The Blues).

The Band of the Regiment also provided the music during the Show.

As will be seen from the table following, the aggregate of admissions to the Show was 107,001. This was greater than at any Show since 1929.

On the 3rd July, the local evening paper informed its readers that "a number of visitors arrived by air, among those using the Ipswich Airport being the Duchess of Bedford."

Special arrangements were made with the Education Authorities for the admission of school children in organised parties on the Friday and Saturday at half-price. Full advantage was taken of this concession, and several thousands of youngsters thus had the advantage of attending the Show.

An innovation at Ipswich was an Information Bureau just inside the Entrance where enquiries by visitors could be answered. Foreign visitors came from France, Germany, Belgium, Holland, Denmark and Poland, and as the young man in charge of the Bureau was able to speak several languages, continental visitors were able to obtain information in their own tongue immediately on entering the Show, which doubtless saved them much time and trouble.

A large number of visitors, mostly from the Continent, (although there was a fair number of Colonial visitors), attended the Show and expressed great interest in all departments. To their enquiries and requirements, Colonel Sir Archibald Weigall and Colonel E. W. Stanyforth, the two Stewards for the reception of persons from overseas, devoted themselves with unfailing attention and offered hospitality on behalf of the Society to those who cared to avail themselves of this.

ADMISSIONS BY PAYMENT AT IPSWICH.

Day of Show.	11 a.m.	1 p.m.	3 p.m.	5 p.m.	Day's Total.
Tuesday (5*s.*)	2,184	3,719	4,494	4,792	4,823
Wednesday (5*s.*), after 2 p.m. (3*s*)	7,603	13,876*	21,285	22,980	23,137
Thursday (3*s.*)	16,777	30,177	35,847	37,449	37,628
Friday (2*s.* 6*d.*)	11,580	16,429	20,000	20,986	21,165
Saturday (1*s.*)	9,614	14,108	18,612	20,093	20,248
Total for Show					107,001

* 2 p.m.

TOTAL DAILY ADMISSIONS AT 1934 SHOW, COMPARED WITH THOSE AT PREVIOUS SIX SHOWS.

Day of Show.	Ipswich, 1934.	Derby, 1933.	Southampton, 1932.	Warwick, 1931.	Manchester, 1930.	Harrogate, 1929.	Nottingham, 1928.
First	4,823	3,171	1,116	1,887	2,483	3,884	2,388
Second	23,137	21,684	8,165	11,273	14,352	23,598	18,244
Third	37,628	26,981	11,686	24,198	31,115	51,252	44,293
Fourth	21,165	13,573	11,997	15,193	14,943	18,924	14,775
Fifth	20,248	30,941	14,614	19,708	38,025	26,359	28,977
	107,001	96,350	47,578	72,259	100,918	124,017	108,677

Cases of fainting and minor troubles were dealt with daily by the St. John Ambulance Brigade at their First Aid Station in the showground. It is with regret that one death has to be recorded, that of Mr. William Adams, one of the oldest members of the English Jersey Cattle Society, who collapsed on the showground, and expired almost immediately.

The British Herdsmen's Club in conjunction with the local branch of the Y.M.C.A. again provided Concerts, Sports, &c., for the herdsmen and stockmen attending to exhibits at the Show.

Literature connected with the Show included an attractively printed and illustrated Souvenir "Ipswich," published by the Industrial Development Association. A specially bound copy of the book was accepted by H.R.H. the Prince of Wales.

A special pamphlet prepared by Mr. C. H. Clarke of the *East Anglian Times*, describing the outstanding features of the Show and translated into several languages, was very widely circulated on the Continent. This has now been adopted as a standard form of advertising for future Shows.

During the week a London newspaper, in a reference to the Show, asserted that what with the extension of the trolley-bus system and other municipal services, the cost of the Royal Show to Ipswich would be a shilling rate. In this connection, it may not be without interest to reproduce the following statement from the Local Press :—

> "It cannot be too strongly emphasised that this is incorrect. The purchase of the ten double-decker trolley-buses is part of the ordinary growth of the system ; and the extension to this terminus on the London Road was decided upon at a public meeting four years ago—long before it was known that the Royal Society had picked upon Ipswich to hold a Show.

"So far from it being a charge upon the rates, it has been reckoned that the passenger revenue of the Royal Show will go a long way to pay for the overhead equipment of the extended route. Further, even if there did remain a charge, it would not fall upon the ratepayers, because both the Electric Supply and the Transport Departments of the Corporation show very considerable profits."

The President attended the Show daily and took a great personal interest in all the details and the arrangements. He was an Exhibitor of Live Stock, securing awards in several classes and also a Silver Medal for his non-competitive exhibit in the Forestry section. The Automatic Safety Gate opening and closing device, which secured a Silver Medal in the New Implement section, was tested on his estate at Henham. Remaining until the close of the Show on Saturday evening and coming in contact as he did with Exhibitors, Stockmen, Officials, &c., the President's interest and enthusiasm for the 1934 Show will not soon be forgotten.

T. B. Turner.

16, Bedford Square,
London, W.C.1.

REPORT ON NEW IMPLEMENTS ENTERED AT THE IPSWICH SHOW, 1934

The total number of implements entered for the Society's silver medal was 13. One of these was withdrawn before the inspection of the Judges took place. The Consulting Engineer has placed at the disposal of the Judges detailed technical reports on the remaining 12, and the Judges have been given ample opportunity of making every kind of observation on the design and working of these implements.

The standard of entries as a whole was considered to be a high one, and most of the unsuccessful and deferred entries may yet prove to be very useful contributions to the rapid mechnical advance that is being made in agriculture. There were six successful entries.

Successful Entries.

I. Pig-Weighing Machine—Entered by Montgomery & Lecoche, 73, Richmond Road, Lincoln. Price, £13 10*s.*

The machine consists of a crate suspended from a spring balance mounted on a lever attached to the cross member of a channel iron frame. The crate is made from angle iron covered with wire mesh and has sliding doors at each end. By means of the lever the crate can be lifted for weighing or allowed to rest on the floor of the framework while the pigs enter or leave it.

The framework is provided with lever handles and cast iron wheels by means of which it can be wheeled about.

The machine is intended for checking the live weight increases of bacon pigs.

Messrs. Montgomery & Lecoche are to be congratulated on selecting a year in which pig weighing, always an important and often neglected sphere of stock management, has assumed the status of a necessity owing to the action of the Pig Marketing Board. Quite apart from this the machine itself is an altogether worthy recipient of the Society's medal. The following extracts are taken from the report of the official tests :—

1. Fifty-nine pigs averaging 172 lb. apiece, housed in four separate pens in a Danish type pig-house, were weighed in a total time of 29 minutes. This included the time taken in moving the machine from pen to pen and in returning the pigs to their pens after weighing. It should be possibe to carry out weighings under any ordinary farm conditions at the rate of two pigs per minute.

FIG 1.—PIG-WEIGHING MACHINE.

2. Two consecutive weighings of 15 pigs in random order differed by only 12 lb. on a total weight of 2,400 lb.
3. The particular crate tested was suitable for bacon pigs up to 240 lb. live weight. Two larger sizes are available.
4. After a period of 10 weeks' constant use on a farm of 1,000 pigs, the machine was in good working order.

The Judges were satisfied that the machine was compact, mobile and strong, and that its selling price offered good value to the purchaser. It might well be a useful addition to a pig-feeding enterprise of any size, but the attention of farmers who wish to have a thoroughly sound weighing machine, but the extent of whose business limits them to a relatively low expenditure, should be particularly directed to this entry.

II. Tractor Cultivator Attachment—Entered by Miller Wheels, Ltd., Station Road, Chelsfield, Kent. Selling price, £22 10s.

This unit is an attachment for a Fordson tractor by which various implements can be directly attached in such a way that they can be lifted by the tractor driver.

The implement tested was a steerage hoe which was attached by two plates to the transmission housing of the tractor. A riding platform was provided for the man steering the hoe, and arrangements were provided whereby the implement could be locked in position in cases where fine steering was not necessary.

Many farmers who appreciate the advantages of the quickness and cheapness of tractor work for primary cultivations such as ploughing and open cultivating, are still going to the expense of maintaining horses and horsemen for their subsequent row-crop cultivations. This is unfortunate since the two essential factors in row-crop cultivations are first, that they should be done quickly while weeds are seedlings and before the ground has had time to run together, and secondly, that they should be done cheaply enough to enable the grower to do them often, thus preserving the best physical condition of the soil, and promoting bacterial action and the retention of moisture during dry periods.

Row-crop cultivation by horses, particularly in districts where soil is heavy and soil resistance high, does not fulfil these requirements. Various attempts have been made over a number of years to apply the power of tractors of normal rating to this form of cultivation, and some of them have been successful up to a point.

It is the opinion of the Judges that the entry of Messrs. Miller Wheels, Ltd., is the most successful they have yet seen on the market. The machine admits of ample adjustment in

relation to depth, spacing and pitch, and it is so designed that each leg or hoe blade has an independent vertical motion, enabling uneven ground to be worked. It can be controlled by the operator on the hoes at relatively high speeds, and it offers an opportunity of enabling the men working with it to do, under most conditions, more work in a given time than they would be able to do with horses.

FIG. 2.—TRACTOR CULTIVATOR ATTACHMENT.

There are one or two minor criticisms which the Judges have to make and which they think the makers of the machine may perhaps find useful in future modifications of their design :—

1. The high position of the lifting lever when the implement is in work would cause difficulties when cultivating among trees. A modification for the particular case of orchard work should be easy to devise.
2. While the hoe operator was able satisfactorily to control the direction of the implement, there was, as was to be expected, a certain amount of resistance to the lateral movement of the hoes. The machine supplied for test was fitted with depth-adjustment wheels carried on grooved stems, so that in steering the hoes the operator had to skid the wheels sideways.

The Judges are of the opinion that the work of the operator in steering would be considerably reduced if the depth-adjustment wheels carried on grooved stems were replaced by suitably designed castor wheels.

3. The hoe operator would surely be more comfortable, and give a more efficient output, if provided with a seat.

It will be observed that the selling price of the machine is no more than the value of an ordinary farm horse, and that the implement should therefore prove a good investment for any tractor owner having a reasonable acreage of row-crop cultivation to do. The machine can also be fitted with ridging bodies, which are adjustable for varying widths.

III. Star-Turn Harrow—Entered by W. N. Nicholson & Sons, Ltd., Newark-on-Trent. Selling price, £27.

The mechanism of these harrows consists of two pairs of spiked rollers mounted in bearings on a framework carried on three adjustable wheels. The two rollers in each pair are geared together at right angles to each other and at an angle of 45 degrees to the line of draught.

When the implement is drawn along, the rollers rotate by virtue of the contact of the spikes with the ground and, on account of the angle at which they are set, the ground is gashed in a series of diagonal cuts.

The rollers are mounted in special bearings so constructed that interwinding of long grass is prevented, and provision is made for lubrication by Tecalamit grease gun.

There is perhaps no form of cultivation so badly neglected at the present time as that of pasture. The acreage of pasture not in need of cultivation is insignificant in comparison to the large areas which would benefit by it. Traditional methods of carrying out such cultivation are very inefficient. The use of ordinary rigid-tined arable harrows, though better than the common method of using the same harrows "brushed" with "hedgings," is quite inadequate under most conditions; and while different forms of spike-toothed chain harrows are useful, they are often not severe enough in their action, and much time may be lost when they become choked with torn-out foggage.

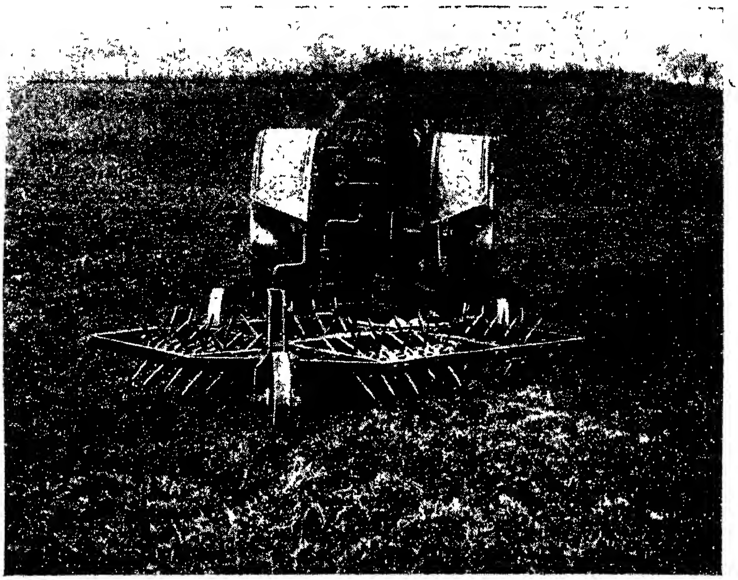

FIG. 8.—STAR-TURN HARROW.

In 1929 the Wilder Pitchpole Harrow offered a novel design, was awarded the Society's medal and is steadily increasing a well-deserved popularity, partly due to its very severe treatment of pasture and partly due to special measures taken by the designers to prevent choking.

Messrs. Nicholson & Sons with their "Star-Turn Harrow" have again introduced an implement which is a departure from orthodox forms of cultivation. In their turn they have given their attention to freedom from choking and to producing an implement capable of performing vigorous cleansing operations.

There is probably no other implement which can engage so many tines in the soil for a given width and at the same time clear itself from choking with torn-out foggage.

Apart from its merits as a grass cultivator the implement would appear to be unique for arable tillage, and the Judges would draw the attention of farmers, and particularly of market gardeners, to its capacity for producing and maintaining a moisture-holding tilth. It is strongly constructed, and while all necessary provisions for adjustments are made, it requires little skill or experience in manipulation.

IV. Pneumatic Tyred Tractor Wheels—Entered by the Dunlop Rubber Company, Fort Dunlop, Birmingham. Selling price, £72.

The wheels are of the disc type and are provided with special hubs to fit different tractors. The rims are 24 in. in nominal diameter and carry special 11·25–24 Dunlop low-pressure tyres of 8-ply construction with Trakgrip tread. Four cast iron weights, each of 56 lb., can be bolted to the wheel discs. Detachable strakes, made in two segments of cast steel, are provided.

The advantages of pneumatic-tyred tractor wheels are that they allow the use of the tractor on the road; that they avoid damage to grassland; that they avoid the pegging down of the crop in hay making, and that they allow smooth running at higher speeds when doing light work.

Observation of a number of these sets of tyres at work in various parts of the country over the past year shows that these advantages are of great importance, particularly on the mixed farm. Formal tests of these wheels are required only to show that, apart from their advantages in special circumstances, they are capable of doing ordinary work at least as well as steel wheels.

The following observations on the performance under test of the Dunlop wheels were made:—

1. On hard dry stubble in middle gear a Fordson tractor fitted with Dunlop tyres developed a greater maximum drawbar horse-power at a higher drawbar pull than the same tractor when fitted with standard steel wheels.

   In bottom gear approximately the same drawbar horse-power was given by both types of equipment.

2. On fairly dry, cultivated land the test performance of the pneumatic-tyred wheels, when fitted with the Dunlop strakes, was almost identical with that of two different types of steel wheels. The strakes were reasonably easy to attach, and were very easy to remove. When used without strakes the Dunlop wheels gave a rather greater drawbar pull, but the horse-power was slightly reduced.

3. When used without strakes on wet grassland the adhesion of the Dunlop wheels was insufficient to transmit the full power of the tractor. When strakes were fitted the adhesion was as good as that of steel wheels, and the performance of the latter was equalled as regards both drawbar horse power and maximum drawbar pull.

4. The Dunlop-tyred wheels allowed the tractor to develop considerably more power in top gear than was possible when steel wheels were fitted.
5. Such tests as have been carried out indicate that under most conditions the fuel consumption per drawbar horse-power of a tractor will be slightly reduced by replacing steel wheels with the pneumatic-tyred wheels.

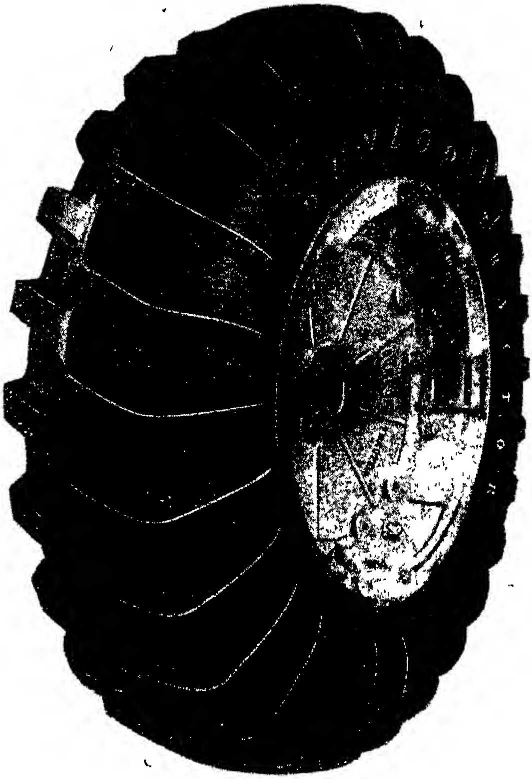

FIG. 4.—DUNLOP PNEUMATIC-TYRED TRACTOR WHEEL.

The question of the relative merits of crawler tracks and of various designs of wheel, and the improvement of such designs, is of great importance at the present time.

Theoretically the cable system of cultivation is still the correct means of applying power to the soil. Horses and tractors alike suffer in comparison, from the fact that power is wasted in propelling the power unit itself, and further

because conditions sometimes exist under which the power unit in its passage over the soil does harm, which the implement following it cannot rectify. In spite of these disadvantages, wheeled tractors and crawler tractors have more than held their own against the cable system because of their versatility, the cheapness of the work they offer, and the merits of some of the implements available for use with them. But an appreciable percentage of power is wasted, and it may be claimed that there can be no more important development in tractor design at the moment than the reduction of this waste.

It is because the Dunlop Rubber Company have made a definite contribution to progress in the reduction of the percentage power wasted, that the Judges have awarded them a Silver Medal for their entry. Apart from a generalisation of the problem, this entry represents an advance in one particular direction.

Steady improvement in tractor design results in a constant increase in engine horse-power in proportion to tractor weight. Thus in the case of most modern wheeled tractors, the maximum drawbar pull at slow speeds is not dependent on engine horse-power, but on adhesion. That is to say, the wheels will spin before the engine is stalled. It therefore follows that the engine often is unable to develop its maximum power at slow speeds, and that in order to use its maximum power, the speed rather than the load must be increased.

The advantages of relatively high-speed work are :—

1. That light machines with less tendency to pack the soil than heavy ones can thus develop more drawbar horse-power than they would otherwise be able to do.
2. That a given horse-power exerted at a high speed, tends less to breakages than the same horse-power at a low speed.
3. That up to a point the resistance to traction of many implements (for example ploughs), is only a little higher at high than at low speeds.

The disadvantage of high-speed work is that, as the working speed increases, the power required to propel the tractor rises rapidly in proportion to the power transmitted to the implement, so that with some makes of tractor it is possible to attain a speed at which the whole power developed by the engine is absorbed in the propulsion of the tractor itself.

This disadvantage constitutes an obstacle to any advance in working speed on the part of steel-wheeled tractors beyond a definite point, and therefore discounts progress in tractor design which increases engine horse-power in proportion to tractor weight.

The introduction of pneumatic wheels has introduced fresh possibilities of high-speed work, as a result of the fact that with these wheels an increase in working speeds results in a lower proportionate increase in power wasted in the propulsion of the tractor itself; in short, higher working speeds are made practicable and light tractors are enabled to develop more drawbar horse-power.

Under these circumstances it appears at first sight paradoxical that the makers of pneumatic wheels should deliberately add weight to them. This addition of weight has been made because it is possible to meet with soil conditions under which the pneumatic wheel will fail altogether to transmit drawbar horse-power, it being for this reason that steel strakes are provided as an alternative to working on the indiarubber tread. The addition of wheel weights is a factor in reducing the frequency of such conditions of failure.

It is difficult to forecast the extent to which pneumatic wheels will displace those with which we are already familiar, but it is certain that there are conditions under which farmers will be better served by the pneumatic wheel than by known types of steel ones, in spite of the relatively high cost of the former.

V. *Automatic Milk Recorder—Entered by The Hosier Open Air Pure Milk Co., Ltd., Wexcombe, Marlborough. Selling price, £5 per milking point.*

This entry is a device for measuring automatically the total quantity of milk passing up the milk pipe from the teat-cups of a milking machine, and it is intended to allow milk recording to be conveniently carried out in conjunction with machine milking. The recorder works on the tilting-bucket principle. Two wedge shaped buckets are rigidly joined together and are mounted on a knife edge about which they can tilt. The milk passes into whichever bucket is uppermost. When this bucket contains exactly a quarter of a pound of milk it tilts by gravity, emptying out its contents and bringing the other bucket to the top.

By means of a baffle-plate the milk supply is cut off during the tilting and is deflected into the second bucket as soon as tilting is completed. By means of an ingenious escapement device, each tilting movement adds one unit to the reading of an ordinary Veeder counter. The whole device is mounted inside a cylindrical container with a removable vacuum-tight domed lid. All the bucket mechanism is mounted on a circular plate which makes a milk-tight joint with the base of the domed lid and so divides the container into two chambers. The milk

from the teat cups passes into the upper chamber and then by gravity through a suitable inlet into the buckets. The lower chamber forms a sump from which the milk is drawn off continuously under vacuum into the standard milk pipe of the milking outfit.

FIG. 5.—AUTOMATIC MILK RECORDER.

The "bail" system of open-air machine milking has established itself as a sound and, in some circumstances, the most economical system of dairy herd management.

It is probable that difficulty in recording the milk yield of cows has hitherto constituted the one serious defect from which the system suffers. In this entry may be found a reliable, convenient and fairly cheap device, which on test has proved itself efficient. The necessity of recording milk yields is universally appreciated and this recorder, fulfilling an urgent need with cheapness and efficiency, could not fail to claim the Society's award.

VI. Automatic Gate-Opening Device—Entered by The Automatic Gates Company, Castle Street, Tipton, Staffs. Selling price, £35.

The selling price includes all costs of fitting to existing field or estate gates and one year's service and maintenance.

In this device platforms are provided at ground level and at convenient distances on either side of the gate. The platforms are connected by a system of levers and cranks to the gate in such a way that the weight of a car resting momentarily on the first platform causes the gate to open. After traversing the gate the car wheel passes over the second platform and causes the gate to close. By an arrangement of springs within a

control box, the rate of opening can be adjusted to suit particular conditions. During the passage of the car the gate is held open by a positive catch. The gate can be operated by hand in the ordinary way, and is self closing whenever it has not been fully opened by a passing car.

Although the Society's regulations admit of awards for equipment likely to be of service for estate purposes, it must not be supposed that an award has been made to this entry solely on this account. It may appear on first consideration that a self-opening and closing gate, while being a luxurious piece of estate equipment, cannot be an economic contribution towards the solution of purely agricultural problems. Further consideration is likely to produce the opposite conclusion.

FIG. 6.—AUTOMATIC GATE-OPENING DEVICE.

In these days a farmer managing a large business must be as nearly as possible ubiquitous. If the gate in question stands at a key position, on the ground he has to cover, he may have to pass through it a dozen or more times a day. For every passage through the gate he must stop his car, get out of it, re-enter and re-start it—not once but twice. For a busy man the loss of time and the fatigue are economic considerations.

If the capital outlay on the automatic gate be written off in ten years, and interest on the capital charged at 4 per cent., the cost of the gate is less than 2s. per week. If the opening and closing of the gate are to be avoided, the alternative to an automatic gate is the fencing off of the road on both sides, for the whole of its length through the enclosure which the gate protects. Such a fence may easily cost more than the gate. It must, moreover, be remembered that while gates are usually thought of as a means of preventing stock from getting out, they are often used, in the case of an arable farmer growing valuable crops, as a means of discouraging stock and human beings from getting in.

The alternative of fencing, while no worse than an expense to the grass farmer, may be both an expense and an inconvenience to the intensive arable farmer. The report given as a result of tests on this gate is entirely satisfactory.

Deferred Entries.

I. *Hornsby-Leake Precision Drill—Entered by Messrs. Ransomes, Sims & Jefferies, Ltd., Orwell Works, Ipswich. Selling price, 12-row drill as tested, £69 ; Extra for 2-wheel fore-carriage steerage, £8 10s.*

The drill submitted for test was a 12-coulter machine with fore-carriage steering and fitted with Suffolk-type coulters working independently, with lever adjustment for depth of sowing.

The outstanding feature of the machine is the feed mechanism, which works on an entirely novel principle which could be adapted to any type of drill.

The mechanism for each pair of coulters consists of a cone which is carried on a vertical spindle inside a hopper placed immediately below the seed box. The cone is rotated by means of gearing from the land wheels and, in addition, is caused to oscillate vertically by means of a ratchet wheel. Seed passes from the seed-box by gravity into the hopper, whence it is spun out in a steady stream into the corresponding seed tubes. The feed to each pair of coulters can be separately adjusted by altering the size of the apertures into the coulter tubes, while a master control which adjusts the seed rate of all the coulters at one operation is also provided.

There is, and for some time has been, an insistent demand for improvement in drill design. This entry, as already stated, has a novel feed mechanism dependent on the principle that a mass of small solids of uniform size and shape, in a vessel which is subjected to rapid agitation, will conform to the behaviour of a fluid rather than to that of a solid mass.

The object of the feed arrangement is to offer a more uniform disposition of seed than has hitherto been obtained.

The high cost of the drill in proportion to its width would have been justifiable had this end been achieved, but unfortunately the test statistics served only to show that its seed distribution was no better than that of the drill against which it was matched for comparative purposes.

It must be admitted that the drill against which the Hornsby-Leake Precision Drill was tested was one which is reputed to give the best-known seed distribution, but since this drill possessed a simpler feed mechanism than the entry on test, the

conclusion that the control drill was the better of the two was inevitable.

The entry has been deferred because, in spite of the failure of the drill to prove its superiority on comparative test, the Judges are of the opinion that the feed itself did give a more uniform flow of seed than any other they have seen, but that the uniformity was lost in the passage of the seed to the ground. This conclusion raises the whole question of drill design in general.

It would appear that if uniformity of flow is obtained at the feed and lost at the ground, the remedy should be to bring the feed as near as possible to the ground, that is to lower the feed unit including the seed-box.

Corn drills with very low seed-boxes are popular with the men who use and fill drills, but less so with those who make them. The maker perhaps has another aspect of the problem to consider. He must stagger his drill legs fore and aft sufficiently to prevent choking of the drill with clods, stubble, potato haulm and so on. It is easy to design a drill with sufficiently staggered legs if it has a high seed-box, and difficult if it has a low one—hence probably, makers' almost universal preference for high boxes in contravention of the preference of users.

But surely the trend of drill design should be towards satisfying the requirements of the man who drills with a tractor. Like all drill users he wants the most uniform distribution of seed obtainable, but more than the user of horse drills the tractor user wants a drill that is quite free from hindrance due to choking, and a drill that has so low a filling level that it can be filled quickly and easily from the ground by one man.

The essential difference between the horse and tractor equipment being that the tractor drill covers so much more ground, the easiest means of feeding it with corn is from bags dropped on the ground at intervals. The horse equipment, with its smaller range, can go to a dray on which corn is left and fill up from that level.

Perhaps it is a fair summary of the state of drill requirements to say that a low seed-box is necessary to give uniform disposition of seed and quick filling, and that a high seed-box may be necessary to enable the operator to be certain that choking between the legs is impossible.

The finding of a remedy for this difficulty is the business of the makers and not of the Judges, but it is of interest to note that a low filling level was one of the advantages in drill design appreciated by the late Walter Dunn, the tops of whose seed-boxes were rarely more than 24 ins. from the ground.

II. Track Laying Tractor—Entered by Messrs. Bristol Tractors, Ltd., Sunbeam Road, Chase Estate, Willesden, London, N.W.10. Selling price, £195. Pulley and power take-off extra.

This is a track-laying type of machine, having an overall width of 35½ ins. and an overall length of 87 ins. The tracks are of the "Roadless" rubber-jointed type, giving 504 sq. ins. ground contact, and are driven from the front sprocket. Steering is by differential and brakes. The tractor is fitted with a horizontally opposed twin cylinder, water cooled, petrol engine; bore 3⅛ ins.; stroke 4 ins.; it is fitted with a governor. The engine is rated at 10 h.p. on the drawbar and 12 h.p. on the belt when running at 2,000 r.p.m. The gearbox gives forward speeds of 1·64, 2·81, and 5·01 m.p.h. and a reverse speed of 1·45 m.p.h. at normal engine speed.

A pulley running at 989 r.p.m. and a power take-off running at 519 r.p.m. are supplied as extras at a cost of £15 15s.

Total weight in working order, without operator, is 2,296 lb.

The drawbar performance of this tractor on test is given in the following table:—

Gear in which tested:	Rated load test.	Maximum load tests.		
	Intermediate.	Low.	Intermediate.	High.
Normal speed, m.p.h. ..	2·81	1·64	2·81	5·01
Duration of test, mins. ..	8	—	—	—
Average drawbar pull, lb. ..	1,463	2,000	1,400	700
Average speed under test, m.p.h.	2·88	1·94	3·12	4·9
Average drawbar power, h.p.	11·2	10·3	11·6	9·3
Track slippage, per cent. ..	—	1·6	0·5	—
Total fuel consumed, lb. ..	73·5	—	—	—
Fuel consumed, lb./h.p.-hr.	0·82	—	—	—

In assessing the merits of an entry of this kind there are two primary considerations:—

1. Performance on test.
2. Expectation of working life in relation to cost price.

The entry is deferred because, while the Judges were satisfied in the case of the first consideration, there was not sufficient evidence to satisfy them on the second. They consider that the tractor is still in its experimental stages. Important changes in design were made after it had been entered for the Society's Medal.

A bold bid to secure some of the business of the manufacture of agricultural tractors for this country is very welcome, but before making an award the Judges must be assured that the tractor as a whole is able to stand up to continuous hard work in the field.

Unsuccessful Entries.

I. Crude Oil Engine—Entered by Messrs. Blackstone & Co., Ltd., Stamford. Selling price, £45.

This is a vertical single-cylinder compression-ignition oil engine rated at 3 h.p. at 700 r.p.m.; bore 3¾ ins., stroke 4½ ins., compression ratio, 15·5 to 1. The engine and cooling tank are separately mounted on a pair of pitch-pine runners and are connected by flexible hose.

The performance of this engine is shown by the following results of tests :—

Normal engine speed : 700 r.p.m.
Fuel used : B.P. Diesoleum.

	Max. load test.	Rated load test.	¾ load test.	½ load test.
Duration of test, hours ..	0·5	3·0	0·75	1·0
Mean h.p.	3·65	3·03	2·30	1·49
Mean engine speed, r.p.m. ..	705	700	717	735
Total fuel used, lb... ..	0·95	4·35	0·59	1·76
Consumption, lb./b.h.p.-hr.	0·54	0·47	0·47	0·95

The makers are to be congratulated on what would appear to be a satisfactory small, slow speed, crude oil engine with their own design of fuel pump. But it was not considered that sufficiently exceptional merit was shown by this entry to justify the award of a medal.

II. Self-Cleaning Grassland Harrow—Entered by Messrs. R. A. Lister & Co., Ltd., Dursley, Glos. Selling price, £23 approx.

In this harrow a series of tines is mounted on a drum which is connected through sprockets and chain to the land wheels. By means of a crank mechanism the tines, of which there are four sets, are kept parallel to the same direction throughout their travel, while the angle of this direction to the vertical can be adjusted by an eccentric and lever. When the machine is in motion the chain drive retards the rotation of the tines and produces a harrowing action.

Stripper bars are placed between the tines to prevent choking and the drum is mounted on skids which regulate the depth of working.

The harrow is intended for use with horses. This entry showed considerable ingenuity of design but in action appeared to possess a limited range of application. It was unable to deal satisfactorily with pasture having a large amount of foggage, and the tine-cleaning mechanism was not always effective.

The Judges were of the opinion that it would be useful as a means of maintaining the condition of good pasture, but that its action would be inadequate to deal with grass in bad condition.

III. All Weather Tractor Wheels—Entered by Sidney C. Darby (Wickford), Ltd., Stilemans Works, Wickford, Essex. Selling price, £22 for Fordson; £25 10s. for International 10/20.

These wheels are built up from standard Fordson wheels, the hubs and spokes being retained and the rims being rejected. The ends of the spokes are rivetted to a series of segment plates which form a narrow rim carrying land grips, spaced alternately on either side. The grips consist of pieces of boiler plate bent so that when one face is bolted to the rim, the other face makes an angle of about 70 degrees to the plane of rotation. The plates ordinarily project outside the rim, and their setting can be adjusted slightly. Alternatively additional rim segments can be fitted to bring the rim circumference flush with the working edge of the grips.

Exhaustive tests were carried out in which this wheel was compared with a standard type of tractor wheel. The tests failed to indicate that the "All weather" wheel would show a greater efficiency in practice than the standard type.

IV. Auto-Recording Milking Plant—Entered by Messrs. Gascoignes (Reading), Ltd., Castle Street, Reading. Selling price: complete from £260 for 2-point bail, £360 for 4-point bail. Sterilizer, £53 10s. extra.

The plant consists of a complete milking bail so arranged that milk recording can be carried out. The recording arrangements are as follow:—

The milk from the teat cups passes through a control tap and a rubber pipe into a glass container which stands on a spring balance placed between two adjacent stalls. The glass container is provided with a vacuum-tight lid through which a second pipe enters to admit air when the container is emptied.

When the control tap is placed in the milking position, the milk is drawn into the glass container and its weight is indicated on the dial of the balance. When the milking of the cow is completed the control tap is changed to the neutral position (in which all milk and air connections are shut off), the teat cups are then removed and the balance reading is taken. The control tap is then moved to a third position—release—and the milk is drawn off from the container through the pipe by which it entered and passes into a collecting vessel at the end of the bail.

An electrically controlled timing arrangement is also fitted by which a red light is lit 4 minutes after milking starts so as to warn the operator that the cow is nearly finished. This device is automatically set each time by the movements of the control tap.

Since the novel features in this entry consisted in the recording and timing devices, it was upon the merits of these that the Judges necessarily based their decision. Both the recorder and the timing device gave good service under test, and under certain conditions this bail may have a useful future before it. The Judges, however, consider that from the point of view of first cost, liability to damage, and particularly of adaptability to existing plants, this entry compares unfavourably with the other milk recorder entered; its merits therefore were not considered to be sufficiently outstanding to deserve an award.

D. R. Bomford.

Bevington Hall,
Evesham.

REPORT OF THE STEWARD OF DAIRYING, IPSWICH SHOW, 1934.

MILK YIELD TRIALS.

CATTLE, CLASSES 223 TO 233.

These trials were conducted on exactly the same lines as at Derby in 1933, when for the first time the weighing of all the competing cows was obviated by dividing the Butter Tests into two classes, the first for cows by the Channel Island, Kerry and Dexter breeds; and the second class for all other breeds. This arrangement considerably simplifies the trials by dispensing with all weighing, and also relieves the Society of the great expense incurred in providing and fitting up a weighbridge, up to the present no objection has been raised to the new system, nor to the holding of the trials before the commencement of the Show proper, with its noise, rush and bustle. For the coming Show at Newcastle-on-Tyne the regulations for these trials have been revised, and the morning's milking put back an hour, which both herdsmen and officials will appreciate. The

Table I.—MILK YIELD CLASSES AT IPSWICH, 1934.

No. in Catalogue.	Exhibitor.	Name of Cow.	Date of Birth.	Date of last Calf.	No. of days in Milk.	Date of last Service.	Milk Yield. Morning.	Milk Yield. Noon.	Milk Yield. Evening.	Milk Yield. Total.	Average Fat percentage.	Points. Milk.	Points. Average Fat per cent. × 4.	Points. Lactation.	Points. Total.	Awards and Remarks.
				1934		1934	Lb. oz.	Lb. oz.	Lb. oz.	Lb. oz.						
Class 222		Dairy Shorthorn. Thrice Milked.														
1183	Major R. F. Fuller	Chalfield Lady Darlington 5th	May 25, 1927	May 22	40	—	28 0	21 0	26 8	75 8	2·13	75·50	8·52	Nil	84·02	Fat below standard
1184	E. Uwins Gillate	Orfold Lydia 5th	July 13, 1925	June 6	25	—	25 0	22 4	22 12	70 0	4·16	70·00	16·64	Nil	86·64	Third Prize
1188	J. Pierpont Morgan	Aldenham Kirklevington Lady 3rd	June 15, 1927	Feb. 11	140	—	29 8	17 12	19 0	66 4	3·66	66·25	14·64	2·00	82·89	Fourth Prize
1192	R. N. Tory	Anderson Bianca 16th	Oct. 14, 1926	May 30	32	—	21 8	17 4	20 12	59 8	2·73	59·50	10·92	Nil	70·42	Fat below standard
1193	Duke of Westminster	Lawnhead Moss Rose 20th	Aug. 21, 1927	May 7	55	—	23 12	22 4	21 8	67 8	2·95	67·50	11·80	1·50	80·80	Fat below standard
1194	Duke of Westminster	Lawnhead Moss Rose 24th	Jan. 22, 1928	June 11	20	—	19 0	16 12	18 0	53 12	3·91	53·75	15·64	Nil	69·39	H.C.
1197	Fredk. Chapman	Flower 3rd	Oct. 20, 1928	June 18	13	—	25 0	18 12	20 4	64 0	3·85	64·00	15·40	Nil	79·40	Reserve
1200	A. Thomas Loyd	Lockinge Dulce 2nd	Oct. 12, 1928	April 9	83	—	26 8	21 0	23 12	71 4	3·03	71·25	12·12	4·30	87·67	Second Prize
1220	G. H. Willis	Knells Golden Duchess 2nd	May 23, 1929	June 17	14	—	27 4	25 12	23 4	76 4	3·06	76·25	12·24	Nil	88·49	First Prize
Class 223		Dairy Shorthorn. Twice Milked.														
1248	W. E. Long	Hurts Monoole	April 24, 1931	April 17	75	June 15	16 4	—	15 12	32 0	4·32	32·00	17·28	3·50	42·78	Insufficient points
Class 224		Lincolnshire Red Shorthorn. Thrice Milked.														
1287	Frank Sainsbury	Bendish Poppy 9th	Feb. 28, 1925	May 17	45	—	27 12	22 4	23 4	73 4	3·05	73·25	15·80	·50	89·55	Second Prize
1288	Scothern Dairy Co.	Lobthorpe Princess	Feb. 7, 1929	April 22	70	—	20 8	6 8	17 4	44 4	2·75	44·25	11·00	3·00	58·25	Fat below standard
1290	Russell Wood	Bendish Nancy 18th	Nov. 12, 1929	June 16	15	—	26 8	21 8	23 12	71 12	4·30	71·75	17·20	Nil	88·95	Third Prize
1291	Russell Wood	Bendish Pansy 19th	Sept. 28, 1929	May 31	31	—	26 12	18 0	18 8	63 4	3·21	63·25	12·84	Nil	76·09	Reserve
1292	Chivers & Sons Ltd.	Histon Acacia 5th	Oct. 20, 1930	May 7	55	—	28 4	22 0	24 12	75 0	3·63	75·00	14·52	1·50	91·02	First Prize
Class 225		South Devon. Thrice Milked.														
1323	Dartington Hall Ltd.	Dartington Hilda	Nov. 28, 1927	June 14	17	—	35 0	17 12	22 4	75 0	3·43	75·00	13·72	Nil	88·72	First Prize
1324	Dartington Hall Ltd.	Pat	July 3, 1922	June 8	23	—	23 0	14 4	17 0	54 4	4·05	54·25	16·20	Nil	70·45	Second Prize
1329	Miss Jervoise Smith	Dittisham Nina 2nd	June 9, 1925	May 24	38	—	23 0	13 12	15 12	52 8	4·21	52·50	16·84	Nil	69·34	Third Prize
Class 226		Red Poll. Thrice Milked.														
1414	Lord Cranworth	Grundisburgh Wanderer	July 4, 1926	May 14	48	—	21 8	20 4	19 12	61 8	4·95	61·50	19·80	·80	82·10	Fourth Prize
1415	F. H. Crittall	Northwick Vim 3rd	May 9, 1926	Mar. 28	95	June 17	22 4	19 4	21 12	63 4	3·25	63·25	13·00	5·50	81·75	Fifth Prize
1418	Mrs. R. M. Foot	White Hill Fair Flirt	Aug. 13, 1928	May 2	60	—	27 12	18 4	24 0	70 0	2·78	70·00	11·12	2·00	83·12	Fat below standard
1419	J. G. Gray	Abbeycombe Clintonia	Aug. 4, 1927	Mar. 1	122	—	14 4	13 4	13 8	41 0	3·76	41·00	15·04	2·00	58·04	Insufficient points
1421	Mrs. M. L. Griffith	Thornham Roseleaf	Nov. 17, 1927	April 20	72	—	17 12	16 8	15 4	49 8	2·66	49·50	10·64	3·20	63·34	Fat below standard
1422	Capt. R. S. Hall	Willow Doll	April 28, 1924	May 29	33	—	21 8	15 8	18 0	55 0	3·36	55·00	13·44	Nil	68·44	H.C.
1426	Henry D. Lewis	Neoton Bella	Sept. 25, 1926	April 23	69	—	20 8	17 4	17 4	55 0	2·81	55·00	11·24	2·90	69·14	Fat below standard
1428	Stuart Paul	Model Victoria	Oct. 6, 1923	Mar. 26	97	May 10	24 4	19 4	22 0	65 8	4·45	65·50	17·80	5·70	89·00	First Prize
1430	Capt. Alan Richardson	Seven Springs Quartz	Jan. 26, 1926	May 24	38	—	24 12	19 12	22 8	67 0	3·85	67·00	15·40	Nil	82·40	Third Prize
1434	Owen H. Smith	Upton Queen B	June 21, 1927	May 27	35	—	20 8	16 8	13 0	50 0	2·91	50·00	11·64	Nil	61·64	Fat below standard
1437	Sir Merrik R. Burrell, Bt.	Knepp Cowslip 14th	Feb. 5, 1929	June 11	20	—	25 12	20 8	24 0	70 4	4·06	70·25	16·24	Nil	86·49	Second Prize
1438	C. H. Cearn	Weston Shingle	Jan. 30, 1930	May 28	34	—	21 4	16 4	18 12	56 4	3·53	56·25	14·12	Nil	70·37	H.C.
1441	Lord Cranworth	Grundisburgh Wander Duck	Mar. 16, 1929	May 27	35	—	20 8	19 4	20 8	60 4	3·26	60·25	13·04	Nil	73·29	H.C.
1443	Mrs. Percy Crossman	Bromley Fragrance 2nd	Mar. 24, 1930	May 9	53	June 25	21 12	16 8	20 0	58 4	3·40	58·25	13·60	1·30	73·15	H.C.
1445	A. W. Gordon	Marham Planchet	Feb. 1, 1929	May 2	60	—	12 12	16 4	15 0	44 0	2·53	44·00	10·12	2·00	56·12	Fat below standard
1448	Mrs. M. L. Griffith	Hallingbury Doleful	Jan. 26, 1929	April 3	89	—	14 8	10 4	13 0	37 12	2·76	37·75	11·04	4·90	53·69	Fat below standard

MILK YIELD CLASSES AT IPSWICH, 1934 (*continued*).

No. in Catalogue	Exhibitor.	Name of Cow.	Date of Birth.	Date of last Calf.	No. of days in Milk.	Date of last Service.	Milk Yield. Morning.	Milk Yield. Noon.	Milk Yield. Evening.	Milk Yield. Total.	Average Fat percentage.	Points. Milk.	Points. Average Fat per cent. × 4.	Points. Lactation.	Points. Total.	Awards and Remarks.
Class 226		**Red Poll. Twice Milked.**		1934		1934	Lb. oz.	Lb. oz.	Lb. oz.	Lb. oz.						
1410	H.M. The King	Necton Daffodil	Sept. 18, 1923	Feb. 3	148	April 7	28 4	—	25 0	53 4	3·77	53·25	15·08	10·80	79·13	Reserve
1416	Capt. Sir H. E. de Trafford, Bt.	Pelham Netta	Jan. 13, 1926	Mar. 29	94	May 29	29 8	—	23 4	52 12	4·02	52·75	16·08	5·40	74·23	H.C.
1429	The Hon. Clive Pearson	Sporle Robinetta	Mar. 19, 1928	June 16	15	—	27 12	—	25 8	53 4	3·40	53·25	13·60	Nil	66·85	H.C.
1450	H. D. Longe	Combs Miss Rosamund 6th	July 16, 1929	1933 Dec. 30	183	Mar. 17	20 12	—	19 8	40 4	2·87	40·25	11·48	12·00	63·73	Fat below standard
Class 227		**Blue Albion. Thrice Milked.**		1934												
1550	Charles Henry Webster	Ivonbrook Betty	Feb. 21, 1930	June 15	16	—	21 8	15 8	16 4	53 4	4·28	53·25	17·12	Nil	70·37	First Prize
1551	Charles Henry Webster	Ivonbrook Tulip	Feb. 25, 1930	Mar. 1	122	April 2	11 4	8 12	12 0	32 0	3·61	32·00	14·44	8·20	54·64	Insufficient points
Class 227		**Blue Albion. Twice Milked.**														
1549	W. E. Glover	Mount Crocus 3rd	Aug. 11, 1929	June 4	27	—	25 0	—	26 0	51 0	4·05	51·00	16·20	Nil	67·20	Second Prize
Class 228		**British Friesian. Thrice Milked.**														
1620	E. G. Barton	Combermere Eleanor 2nd	Nov. 6, 1928	June 9	22	—	31 0	26 4	27 12	85 0	3·28	85·00	13·12	Nil	98·12	Fifth Prize
1621	F. J. Carter	Chelmsford Pearl 3rd	Oct. 18, 1928	June 7	24	—	21 8	16 4	18 12	56 8	3·31	56·50	13·24	Nil	69·74	H.C.
1622	Thos. G. Fairhead	Covenbrook Lively 2nd	Feb. 4, 1926	June 7	24	—	35 0	28 12	30 4	94 0	3·00	94·00	12·00	Nil	106·00	Second Prize
1624	F. W. Gilbert	Winterbourne Dotterell 2nd	Oct. 29, 1926	June 8	23	—	29 0	25 12	27 4	82 0	2·68	82·00	10·72	Nil	92·72	Fat below standard
1627	W. J. Newman	Creeksea Xmas Day	Dec. 25, 1927	June 2	29	—	25 4	22 8	23 8	71 4	2·83	71·25	11·32	Nil	82·57	Fat below standard
1628	Bertram Parkinson	Creskeld Piper 3rd	Mar. 24, 1927	May 13	49	—	35 0	26 12	29 12	91 8	3·51	91·50	14·04	·90	106·44	First Prize
1630	Piddington (Northants.) Estates, Ltd.	Egginton Miedema 2nd	Oct. 14, 1925	June 17	14	—	30 12	25 12	26 0	82 8	2·96	82·50	11·84	Nil	94·34	Fat below standard
1632	Piddington (Northants.) Estates, Ltd.	Groundwell Alice 7th	Mar. 9, 1926	June 11	20	—	25 0	23 4	20 12	69 0	3·10	69·00	12·40	Nil	81·40	H.C.
1633	Piddington (Northants.) Estates, Ltd.	Thurston Karel Cynthia	Mar. 25, 1927	June 18	13	—	28 12	23 8	23 8	75 12	4·71	75·75	18·84	Nil	94·59	H.C.
1634	Lord Rayleigh	Terling Dazzle 15th	Feb. 24, 1927	May 12	50	—	31 4	23 0	27 8	81 12	3·96	81·75	15·84	1·00	98·59	Fourth Prize
1635	Lord Rayleigh	Terling Floss Hall 16th	Feb. 14, 1926	June 3	28	—	29 12	27 4	31 0	88 0	2·26	88·00	9·04	Nil	97·04	Fat below standard
1638	Cecil Ball	Oakham Dairymaid	Mar. 17, 1929	June 5	26	—	30 8	27 8	30 12	88 12	3·60	88·75	14·40	Nil	103·15	Third Prize
1642	F. W. Gilbert	Chellaston Gretel	Jan. 2, 1929	June 11	20	—	32 8	28 4	29 12	90 8	2·96	90·50	11·84	Nil	102·34	Fat below standard
1645	Lord Rayleigh	Terling Breeze 36th	Sept. 30, 1929	June 11	20	—	30 4	26 0	27 4	83 8	3·35	83·50	13·40	Nil	96·90	Reserve
Class 229		**Ayrshire. Thrice Milked.**														
1721	Capt. W. B. Dronsfield	Leaths Annabella	Feb. 13, 1925	June 19	12	—	21 4	19 8	19 12	60 8	3·51	60·50	14·04	Nil	74·54	Third Prize
1722	Eshott Pedigree Stock Farms	Eshott Princess	Mar. 9, 1926	June 13	18	—	19 4	16 0	19 0	54 4	4·20	54·25	16·80	Nil	71·05	Reserve
1724	Mrs. J. Greenshields	Catlins Bluebell	Nov. 20, 1927	June 10	21	—	27 12	22 4	25 0	75 0	3·33	75·00	13·32	Nil	88·32	First Prize
1735	A. W. Montgomerie	Chapelhill Cissy 3rd	Jan. 13, 1925	May 14	48	—	22 8	22 8	22 8	67 8	2·86	67·50	11·44	·80	79·74	Fat below standard
1739	Lord Rayleigh	Balgreddan Jess 2nd	Feb. 20, 1929	May 11	51	—	22 12	20 8	20 0	63 4	3·23	63·25	12·92	1·10	77·27	Second Prize
1744	James Turner	Loaninghead Pansy	May 3, 1927	June 8	23	—	18 8	16 0	16 12	51 4	3·71	51·25	14·84	Nil	66·09	H.C.

Class 230		Guernsey. Thrice Milked.														
1816	Capt. Cosmo Douglas	Hazelby Sunshine	Feb. 17, 1928	April 20	72	—	19 4	16 0	17 12	53 0	3·93	53·00	15·72	3·20	71·92	Reserve
1817	W. Dunkels	Fernhill Rose 2nd	Mar. 28, 1928	April 28	64	—	21 4	14 4	15 4	50 12	4·66	50·75	18·64	2·40	71·79	H.C.
1818	H. A. Y. Dyson	Primrose of Pothill	May 16, 1929	April 1	91	June 29	22 0	20 12	19 8	62 4	3·40	62·25	13·60	5·10	80·95	First Prize
1820	Esmond D. Fairweather	May Boy Daisy of the Blanche	June 6, 1924	June 19	12	—	25 12	20 0	20 8	66 4	3·65	66·25	14·60	Nil	80·85	Second Prize
1821	Esmond D. Fairweather	Rex's Primrose of Maison de Bas	Sept. 22, 1927	May 3	59	June 4	24 12	20 4	19 12	64 12	3·13	64·75	12·52	1·90	79·17	Third Prize
1824	Capt. Harold J. Pilbrow	Mapleton Midsummer	June 20, 1929	Mar. 21	102	—	14 4	11 12	12 12	38 12	4·26	38·75	17·04	5·00	60·79	H.C.
1829	Lord Swaythling	Otterbourne Sylvia	Sept. 7, 1928	April 28	64	June 25	21 4	6 4	17 0	44 8	4·36	44·50	17·44	2·40	64·34	H.C.
1834	Capt. Cosmo Douglas	Hazelby Honoria	May 4, 1931	Mar. 16	107	June 26	20 0	17 0	19 0	56 0	3·25	56·00	13·00	6·70	75·70	Fifth Prize
1835	Capt. Cosmo Douglas	Meadow Sweet 5th of Chute Standen	Sept. 30, 1930	Mar. 30	93	—	19 12	18 0	20 12	58 8	3·71	58·50	14·84	5·00	78·34	Fourth Prize
1845	Lord Swaythling	De Baugy's Midget 5th	Aug. 14, 1930	Feb. 1	150	June 16	17 8	14 12	17 8	49 12	2·91	49·75	11·64	4·00	65·39	Fat below standard
Class 230		Guernsey. Twice Milked.														
1819	C. C. Empson	Le Grand Marais Violet 2nd	Mar. 18, 1923	May 6	56	—	27 0	—	23 8	50 8	4·47	50·50	17·88	1·60	69·98	H.C.
1831	W. G. Trower	Stanstead Rose 48th	July 1, 1926	Mar. 12	111	—	23 4	—	19 0	42 4	4·80	42·25	19·20	5·00	66·45	H.C.
Class 231		Jersey. Thrice Milked.														
1938	Grosvenor Berry	Rosie	Mar. 21, 1928	Mar. 5	118	June 18	19 4	13 12	14 0	47 0	4·36	47·00	17·44	7·80	72·24	Reserve
1940	Mrs. G. J. Caddey	Snow Cloud	Feb. 27, 1930	Mar. 29	94	June 26	15 4	11 8	13 4	40 0	5·91	40·00	23·64	5·40	69·04	H.C.
1946	Capt. R. S. Hall	Queening	Sept. 14, 1929	Mar. 8	115	May 15	12 4	8 0	8 0	28 4	5·36	28·25	21·44	7·50	57·19	H.C.
1950	Capt. E. L. Hughes, R.N.	Princess Peggy	Oct. 24, 1928	May 27	35	—	21 8	17 8	17 0	56 0	5·28	56·00	21·12	Nil	77·12	Fifth Prize
1956	S. S. Lockwood	Cowslip 5th	Dec. 22, 1927	April 30	62	—	22 8	17 8	18 0	58 0	4·60	58·00	18·40	2·20	78·60	Fourth Prize
1960	Gordon McWilliam	Bollhayes May's Sunrise	Nov. 15, 19·8	Feb. 13	138	June 3	22 12	16 8	18 12	58 0	4·41	58·00	17·64	4·00	79·64	Third Prize
1996	Grosvenor Berry	Starting Silver 2nd	Jan. 13, 1932	May 6	56	—	16 8	13 0	12 12	42 4	4·11	42·25	16·44	1·60	60·29	H.C.
1997	Wallace Elliot	Hook Lucky Locket	April 13, 1932	May 4	58	—	10 12	7 10	10 0	28 8	4·26	28·50	17·04	1·80	47·34	Insufficient points
Class 231		Jersey. Twice Milked.														
1941	Mrs. Evelyn	Wotton Desert Sun	July 6, 1929	April 19	73	—	24 12	—	21 8	46 4	4·62	46·25	18·48	3·30	68·03	H.C.
1942	Mrs. Evelyn	Wotton May Moon	June 19, 1923	Mar. 13	110	—	26 0	—	21 8	47 8	4·35	47·50	17·40	5·00	69·90	H.C.
1952	Mrs. A. M. Josselyn	Roseland Coral Cluster	June 9, 1929	June 17	14	—	22 0	—	19 12	41 12	4·25	41·75	17·00	Nil	58·75	H.C.
1964	H. S. Mountain	Sir Laurence's Imogen	Feb. 19, 1929	May 25	37	—	33 12	—	29 12	63 8	4·50	63·50	18·00	Nil	81·50	First Prize
1967	Mrs. A. E. Phillips	Dalby Christabelle	Sept. 26, 1930	Mar. 14	109	—	23 4	—	20 12	43 0	4·92	43·00	19·68	5·00	67·68	H.C.
1968	Mrs. A. E. Phillips	Dalby Lilac Time	May 7, 1926	Mar. 1	122	June 22	21 0	—	17 4	38 4	4·87	38·25	19·48	4·00	61·73	H.C.
1969	Wm. E. Press	Miss Bayard's Tulip 2nd	May 24, 1927	Mar. 4	119	June 10	21 0	—	17 8	38 8	5·42	38·50	21·68	7·90	68·08	H.C.
1972	E. A. Strauss, M.P.	Kingston Daphne	Mar. 29, 1926	Mar. 2	121	—	26 8	—	21 8	48 0	5·00	48·00	20·00	2·00	70·00	H.C.
1973	E. A. Strauss, M.P.	Kingston Viola	April 10, 1930	April 8	84	—	27 0	—	21 4	48 4	3·20	48·25	12·80	4·40	65·45	H.C.
1976	Lady Walston	Newton Queen 4th	April 16, 1930	April 19	73	—	28 12	—	22 12	51 8	6·45	51·50	25·80	3·30	80·60	Second Prize
Class 232		Kerry. Thrice Milked.														
2043	Kerry Cow Dairy Farms	Minley Winnie 2nd	Aug. 29, 1922	June 12	19	—	13 4	10 0	11 12	35 0	3·31	35·00	13·24	Nil	48·24	Third Prize
2044	H. E. Mitchell	Cuckfield Pearl	May 20, 1925	May 22	40	—	19 8	15 4	16 4	51 0	3·55	51·00	14·20	Nil	65·20	Second Prize, Res. Elmhurst Challenge Cup
2047	Newton R. Steel	Gort Tulip	May 21, 1924	May 10	52	—	24 12	17 4	19 0	61 0	3·41	61·00	13·64	1·20	75·84	First Prize and Elmhurst Challenge Cup
Class 233		Dexter. Thrice Milked.														
2070	Mrs. Ernest Johnson	Ashtonhayes Mary	Jan. 30, 1926	April 23	69	June 17	13 12	10 0	11 0	34 12	3·88	34·75	15·52	2·90	53·17	H.C.
2072	Lady Loder	Grinstead Nightingale 3rd	Dec. 19, 1925	May 18	44	—	17 4	12 4	14 0	43 8	3·96	43·50	15·84	·40	59·74	First Prize and D.C.S. Challenge Cup
2073	Lady Loder	Grinstead Tropaeolum 2nd	Aug. 28, 1926	April 28	64	—	15 12	9 0	14 12	39 8	3·08	39·50	12·32	2·40	54·22	Reserve
2075	Mrs. H. P. May	Braxted Red Peach	June 18, 1928	Mar. 30	93	—	14 8	5 0	10 8	30 0	3·06	30·00	12·24	5·00	47·24	Insufficient points
2077	Mrs. Howard Palmer	Grinstead Convolvulus 4th	Mar. 31, 1930	May 5	57	—	16 0	10 4	14 8	40 12	3·41	40·75	13·64	1·70	56·09	Second Prize and Res. D.C.S. Challenge Cup
Class 233		Dexter. Twice Milked.														
2069	Roy N. Corner	Ratcliffe Blackbird	Nov. 24, 1926	Mar. 21	102	—	14 0	—	12 4	26 4	4·20	26·25	16·80	5·00	48·05	H.C.
2071	Miss N. M. Lloyd	Pentre Hobyn Jasmine	April 22, 1927	May 24	38	June 28	21 0	—	18 0	39 0	3·82	39·00	15·28	Nil	54·28	Third Prize
2078	Mrs. T. H. Payton	Loganberry of Grinstead	Mar. 12, 1928	May 6	56	—	25 4	—	21 0	46 4	2·85	46·25	11·40	1·60	59·25	Fat below standard

points for service have been altered to conform more with ordinary practice, and the points for butter-fat will be awarded only for percentages which exceed three per cent.—the government standard. The butter-fat points will be calculated on the true average quality of all the milk, and not as at present; and any thrice-milker falling below the three per cent. standard at two milkings will be disqualified forthwith. The Society is ever anxious to make these trials as closely applicable to everyday practice as it is possible to do under the somewhat abnormal showyard conditions. Of the 127 cows which had been entered for the Milk Yield Trials, 102 competed, the largest number since 1926; only 21 of these were milked twice daily, 10 of them being Jerseys. The best breed performances were as follow:—

TABLE II.

Breed.	Name of Cow.	Yield of milk.	Average fat percentage.	Total points.
		lb.		
Dairy Shorthorn	Knells Gold Duchess 2nd	76¼	3·06	88·49
Lincoln Red ...	Histon Acacia 5th ...	75	3·63	91·02
South Devon	Dartington Hilda ..	75	3·43	88·72
Red Poll .	Model Victoria	65½	4·45	89·00
Blue Albion	Ivonbrook Betty ...	53¼	4·28	70·37
British Friesian .	Creskeld Piper 3rd	91½	3·51	106·44
Ayrshire	Catlins Bluebell ...	75	3·33	88·32
Guernsey . .	Primrose of Pothill	62¼	3·40	80·95
Jersey ...	Sir Laurence's Imogen	63½	4·50	81·50
Kerry	Gort Tulip	61	3·41	75·84
Dexter ...	Grinstead Nightingale 3rd	43½	3·96	59·74

TABLE III.—*Average Results in Milk Yield Classes.*

No. of cows competing.	Breed.	Days in milk.	Yield of milk.		Fat percentage.	Total points.
			lb.	oz.		
10	Dairy Shorthorn	48	62	11	3·38	77·25
5	Lincolnshire Red Shorthorn	43	65	8	3·55	80·77
3	South Devon	26	60	9	3·90	76·17
20	Red Poll	70	54	7	3·42	71·80
3	Blue Albion	55	45	7	3·98	64·07
14	British Friesian ..	26	81	4	3·25	94·53
6	Ayrshire	29	61	15	3·47	76·17
12	Guernsey	82	53	2	3·88	72·14
18	Jersey	85	45	13	4·77	68·51
3	Kerry	37	55	11	3·42	63·09
8	Dexter	65	37	8	3·53	54·00

Amongst the breeds we note an improvement in the Dairy Shorthorns, and a very fine show—as might be expected in East Anglia—of Red Polls, with quite a good performance for this dual-purpose breed.

British Friesians too did very well; the Kerrys were wonderful, with an average yield of well over 55 lb., and amongst individual cows the leading Jerseys and Kerry were notable for their fine yields.

BUTTER TEST TRIALS.

CLASSES 234 AND 235.

Fifty-eight cows competed out of the 71 which had been entered, the highest number since the Newport Show in 1927.

TABLE IV.—*Average Results of Breeds entered in Butter Test.*

No. of cows competing.	Breed.	Days in milk.	Yield of milk.	Yield of butter.	Butter ratio in lb.	Points.
			lb. oz.	lb. oz.		
11	Guernsey	84	53 5	2 1	25·85	44·40
15	Jersey ..	96	48 2	2 $9\frac{1}{8}$	18·63	52·71
1	Kerry	19	35 0	—	—	Disq.
1	Dexter .	64	39 8	1 $4\frac{1}{4}$	31·20	28·65
5	Dairy Shorthorn	25	69 1	2 $2\frac{1}{2}$	32·07	41·25
5	Lincoln Red Shorthorn	45	65 8	2 $5\frac{1}{8}$	28·09	44·90
3	South Devon .	26	60 9	2 $6\frac{1}{2}$	25·18	47·83
5	Red Poll	58	56 10	1 $12\frac{1}{2}$	31·66	35·60
10	British Friesian	29	82 5	2 $9\frac{1}{4}$	31·93	47·84
2	Ayrshire ..	37	57 4	1 $15\frac{1}{2}$	29·08	37·05

The Jerseys have put up a wonderful performance this year. for both total yield of butter and yield per gallon or butter ratio as shown above; for the average yield was over $2\frac{1}{2}$ lb. of butter daily, bearing in mind that it has taken but $18\frac{1}{2}$ lb. of milk to produce a pound of butter, is really fine work. The Friesians show up well for their total yield of butter, but it was of inferior quality, averaging only 6·4 points out of a maximum of ten for quality, as against 7·6 by the Jerseys and Guernseys, and 9·3 by the South Devons. In the light breeds class the Jersey "Newton Queen 4th" won with a yield of 3 lb. 10 oz. of butter, and a butter ratio of 14·20, remarkably good figures. This cow was also supreme champion of the Butter Tests, her milk averaging 6·45 per cent. of butter fat; second to her came the British Friesian "Terling Dazzle 15th," with 3 lb. 8 oz. of butter, and a butter ratio of 23·35, very good figures for this breed; third place was shared by the Jersey "Princess Peggy," and the Lincoln Red "Bendish Nancy 18th."

TABLE V.—RESULTS OF BUTTER TESTS AT IPSWICH, 1934.

CLASS 234.—COWS OF GUERNSEY, JERSEY, KERRY OR DEXTER BREEDS.

No. in Catalogue.	Exhibitor.	Name of Cow.	Date of Birth.	Date of last Calf.	No. of Days in Milk.	Date of last Service.	Milk yield in 24 hours. Lb.	oz.	Butter Yield. Lb.	oz.	Ratio, viz. lb. milk to lb. Butter.	No. of Points for Butter.	No. of Points for period of Lactation.	No. of Points for Quality of Butter.	Total No. of Points.	Award and Remarks.
		Guernseys.		1934		1934										
1816	Capt. Cosmo Douglas	Hazelby Sunshine	Feb. 17, 1928	April 20	72	—	53	0	2	1½	25·81	33·50	3·20	8·00	44·70	H.C., E.G.C.S. Certificate of Merit
1818	H. A. Y. Dyson	Primrose of Pothill	May 16, 1929	April 1	91	June 20	62	4	2	4	27·66	36·00	5·10	7·00	48·10	H.C., E.G.C.S. Certificate of Merit
1819	C. C. Empson	Le Grand Marais Violet 2nd	Mar. 18, 1928	May 6	56	—	50	8	2	3½	22·76	35·50	1·60	8·00	45·10	H.C., E.G.C.S. Certificate of Merit
1820	Esmond D. Fairweather	May Boy Daisy of the Blanche	June 6, 1924	June 19	12	—	66	4	2	7½	26·83	39·50	Nil	6·00	45·50	H.C., E.G.C.S. Certificate of Merit
1821	Esmond D. Fairweather	Rex's Primrose of Maison de Bas	Sept. 22, 1927	May 3	59	June 4	64	12	2	1¾	30·69	33·75	1·90	6·00	41·65	Ratio over 30
1824	Capt. H. J. Pilbrow	Mapleton Midsummer	June 20, 1929	Mar. 21	102	–	38	12	1	12¾	21·56	28·75	5·00	7·00	40·75	H.C.
1829	Lord Swaythling	Otterbourne Sylvia	Sept. 7, 1928	April 28	64	June 25	44	8	1	14¾	23·15	30·75	2·40	7·00	40·15	H.C.
1831	W. G. Trower	Stanstead Rose 48th	July 1, 1926	Mar. 12	111	—	42	4	2	1	20·48	33·00	5·00	9·00	47·00	H.C., E.G.C.S. Certificate of Merit
1834	Capt. Cosmo Douglas	Hazelby Honoria	May 4, 1931	Mar. 16	107	June 26	56	0	1	13¾	30·11	29·75	6·70	7·00	43·45	Ratio over 30
1835	Capt. Cosmo Douglas	Meadow Sweet 5th of Chute Standen	Sept. 30, 1930	Mar. 30	93	—	58	8	2	7	24·00	39·00	5·00	9·00	53·00	H.C., E.G.C.S. Certificate of Merit
1845	Lord Swaythling	De Baugy's Midget 5th	Aug. 14, 1930	Feb. 1	150	June 16	49	12	1	8	33·16	24·00	4·00	7·00	35·00	Ratio over 30
		Jerseys.														
1938	Grosvenor Berry	Rosie	Mar. 21, 1928	Mar. 5	118	June 18	47	0	2	2¼	21·95	34·25	7·80	6·00	48·05	H.C., E.J.C.S. Certificate of Merit
1940	Mrs. G. J. Caddey	Snow Cloud	Feb. 27, 1930	Mar. 29	94	June 26	40	0	2	8½	15·80	40·50	5·40	8·00	53·90	Reserve and E.J.C.S. Certificate of Merit
1941	Mrs. Evelyn	Wotton Desert Sun	July 6, 1929	April 19	73	—	46	4	2	6½	19·22	38·50	3·30	8·00	49·80	H.C. and E.J.C.S. Certificate of Merit
1942	Mrs. Evelyn	Wotton May Moon	June 19, 1923	Mar. 13	110	—	47	8	2	6	20·00	38·00	5·00	7·00	50·00	H.C. and E.J.C.S. Certificate of Merit
1950	Capt. E. L. Hughes, R.N.	Princess Peggy	Oct. 24, 1928	May 27	85	—	56	0	3	2½	17·74	50·50	Nil	9·00	59·50	2nd Prize and E.J.C.S. Silver Medal

		Jerseys.		1934		1934	Lb. oz.	Lb. oz.					
1956	S. S. Lockwood . .	Cowslip 5th . . .	Dec. 22,1927	April 30	62	—	58 0	2 13½	20·39	45·50	2·20	8·00	55·70	5th Prize
1960	Gordon McWilliam .	Bollhayes May's Sunrise	Nov. 15, 1928	Feb. 18	138	June 3	58 0	2 11½	21·33	48·50	4·00	6·00	58·50	H.C. and E.J.C S. Certificate of Merit
1963	H. S. Mountain . .	Sir Laurel's Berthe .	July 26, 1926	Feb. 13	138	May 12	38 0	2 7	15·58	39·00	9·80	9·00	57·80	4th Prize
1964	H. S. Mountain . .	Sir Laurence's Imogen	Feb. 19, 1929	May 25	37	—	63 8	3 2	20·32	50·00	Nil	8·00	58·00	3rd Prize and E.J.C.S. Bronze Medal
1967	Mrs. A. E. Phillips .	Dalby Christabelle .	Sept. 26, 1930	Mar. 14	109	—	48 0	2 4½	18·84	36·50	5·00	8·00	49·50	H.C. and E.J.C.S. Certificate of Merit
1968	Mrs. A. E. Phillips .	Dalby Lilac Time .	May 7, 1926	Mar. 1	122	June 22	38 4	2 0¾	18·68	32·75	4·00	9·00	45·75	H.C. and E.J.C.S. Certificate of Merit
1969	Wm. E. Press . .	Miss Bayard's Tulip 2nd	May 24, 1927	Mar. 4	110	June 10	38 8	2 4½	16·87	36·50	7·00	7·00	51·40	H.C. and E.J.C.S. Certificate of Merit
1972	E. A. Strauss, M.P. .	Kingston Daphne .	Mar. 29, 1926	Mar. 2	121	—	48 0	2 10	18·28	42·00	2·00	8·00	52·00	H.C. and E.J.C.S. Certificate of Merit
1973	E. A. Strauss, M.P. .	Kingston Viola . .	April 10, 1930	April 8	84	—	48 4	1 9	30·88	25·00	4·40	7·00	36·40	Ratio over 30
1976	Lady Walston . .	Newton Queen 4th .	April 16, 1930	April 19	73	—	51 8	3 10	14·20	58·00	3·80	8·00	69·80	1st Prize and E.J.C.S. Gold Medal, Champion Gold Medal R.A.S.E.
		Kerrys.												
2048	Kerry Cow Dairy Farms	Minley Winnie 2nd .	Aug. 29, 1922	June 12	19	—	35 0	—			Nil			Disqualified
		Dexter.												
2078	Lady Loder . . .	Grinstead Tropaeoleum 2nd	Aug. 28, 1926	April 28	64	—	39 8	1 4½	31·20	20·25	2·40	6·00	28·65	Ratio over 30

TABLE V.—RESULTS OF BUTTER TESTS AT IPSWICH, 1934 (*continued*).

CLASS 285.—COWS OF ANY OTHER BREED.

No. in Catalogue.	Exhibitor.	Name of Cow.	Date of Birth.	Date of last Calf.	No. of Days in Milk.	Date of last Service.	Milk yield in 24 hours.	Butter Yield.	Ratio, viz. lb. milk to lb. Butter.	No. of Points for Butter	No. of Points for period of Lactation.	No. of Points for Quality of Butter.	Total No. of Points.	Awards and Remarks.
		Dairy Shorthorn.		1934		1934	Lb. oz.	Lb. oz.						
1183	Major R. F. Fuller	Chalfield Lady Darlington 5th	May 25, 1927	May 22	40	—	75 8	1 5½	55·54	21·75	Nil	5·00	26·75	Ratio over 30
1184	E. Uwins Gillate	Orfold Lydia 5th	July 13, 1925	June 6	25	—	70 0	2 13	24·88	45·00	Nil	7·00	52·00	H.C.
1192	R. N. Tory	Anderson Bianca 16th.	Oct. 14, 1926	May 30	32	—	59 8	1 9	38·08	25·00	Nil	8·00	33·00	Ratio over 30
1197	Fredk. Chapman	Flower 3rd	Oct. 20, 1928	June 18	13	—	64 0	2 9½	24·67	41·50	Nil	6·00	47·50	H.C.
1220	G. H. Willis	Knells Golden Duchess 2nd	May 23, 1929	June 17	14	—	76 4	2 7	31·28	39·00	Nil	8·00	47·00	Ratio over 30
		Lincolnshire Red Shorthorn.												
1287	Frank Sainsbury	Bendish Poppy 9th	Feb. 28, 1925	May 17	45	—	73 4	3 1	23·91	49·00	·50	8·00	57·50	3rd Prize
1288	Scothern Dairy Co.	Lobthorpe Princess	Feb., 1929	April 22	70	—	44 4	1 0	44·25	16·00	3·00	6·00	25·00	Ratio over 30
1290	Russell Wood	Bendish Nancy 18th	Nov. 12, 1929	June 16	15	—	71 12	3 5½	21·45	53·50	Nil	6·00	59·50	2nd Prize
1291	Russell Wood	Bendish Pansy 19th	Sept. 28, 1929	May 31	31	—	63 4	1 14½	33·18	30·50	Nil	7·00	37·50	Ratio over 30
1292	Chivers & Sons Ltd.	Histon Acacia 5th	Oct. 20, 1930	May 7	55	—	75 0	2 6½	31·16	38·50	1·50	7·00	47·00	Ratio over 30
		South Devon.												
1323	Dartington Hall Ltd.	Dartington Hilda	Nov. 28, 1927	June 14	17	—	75 0	2 12	27·27	44·00	Nil	10·00	54·00	Reserve
1324	Dartington Hall Ltd.	Pat	July 3, 1922	June 8	23	—	54 4	2 2	25·52	34·00	Nil	9·00	43·00	H.C.
1329	Miss Jervoise Smith	Dittisham Nina 2nd	June 9, 1925	May 24	38	—	52 8	2 5½	22·40	37·50	Nil	9·00	46·50	H.C.
		Red Poll.												
1418	Mrs. R. M. Foot	White Hill Fair Flirt	Aug. 13, 1928	May 2	60	—	70 0	1 10	43·07	26·00	2·00	5·00	33·00	Ratio over 30
1419	J. G. Gray	Abbeycombe Clintonia	Aug. 4, 1927	Mar. 1	122	—	41 0	1 6½	29·48	22·25	2·00	5·00	29·25	
1432	Capt. R. S. Hall	Willow Doll	April 28, 1924	May 29	33	—	55 0	1 14	29·33	30·00	Nil	8·00	38·00	H.C.
1430	Capt. Alan Richardson	Seven Springs Quartz	Jan. 26, 1926	May 24	38	—	67 0	2 10	25·52	42·00	Nil	7·00	49·00	H.C.
1434	Owen H. Smith	Upton Queen B	June 21, 1927	May 27	35	—	50 0	1 6½	35·16	22·75	Nil	6·00	28·75	Ratio over 30
		British Friesian.												
1620	E. G. Barton	Combermere Eleanor 2nd	Nov. 6, 1928	June 9	22	—	85 0	2 14½	29·09	46·75	Nil	6·00	52·75	H.C.
1621	F. J. Carter	Chelmsford Pearl 3rd	Oct. 18, 1928	June 7	24	—	56 8	1 11	33·48	27·00	Nil	5·00	32·00	Ratio over 30
1622	Thos. G. Fairhead	Covenbrook Lively 2nd	Feb. 4, 1926	June 7	24	—	94 0	2 13¼	33·28	45·25	Nil	6·00	51·25	Ratio over 30
1624	F. W. Gilbert	Winterbourne Dotterell 2nd	Oct. 29, 1926	June 8	23	—	82 0	1 15½	41·65	31·50	Nil	7·00	38·50	Ratio over 30
1627	W. J. Newman	Creeksea Xmas Day	Dec. 25, 1927	June 2	29	—	71 4	2 3	32·57	35·00	Nil	6·00	41·00	Ratio over 30
1628	Bertram Parkinson	Creskeld Piper 3rd	Mar. 24, 1927	May 13	49	—	91 8	3 1¼	29·72	49·25	·90	7·00	57·15	4th Prize
1684	Lord Rayleigh	Terling Dazzle 15th	Feb. 24, 1927	May 12	50	—	81 12	3 8	23·35	56·00	1·00	6·00	63·00	1st Prize and Res Champion Gold Medal
1635	Lord Rayleigh	Terling Floss Hall 16th	Feb. 14, 1926	June 3	28	—	88 0	1 12¼	49·84	28·25	Nil	5·00	33·25	Ratio over 30
1642	F. W. Gilbert	Chellaston Gretel	Jan. 2, 1929	June 11	20	—	90 8	2 13½	31·82	45·50	Nil	9·00	54·50	Ratio over 30
1645	Lord Rayleigh	Terling Breeze 36th	Sept. 30, 1929	June 11	20	—	83 8	3 0	27·83	48·00	Nil	7·00	55·00	5th Prize
		Ayrshire.												
1739	Lord Rayleigh	Balgreddan Jess 2nd	Feb. 20, 1929	May 11	51	—	63 4	2 3	28·91	35·00	1·10	7·00	43·10	H.C.
1744	James Turner	Loaninghead Pansy	May 3, 1927	June 8	23	—	51 4	1 12	29·28	28·00	Nil	3·00	31·00	Below standard

Table VI.—MILK YIELD CLASSES FOR GOATS AT IPSWICH, 1934.

Class 248.—QUALITY.

No. in Catalogue.	Exhibitor.	Name of Goat.	Breed.	Date of Birth.	Date of last Kid.	No. of days in Milk.	Milk Yield. Morn.	Milk Yield. Even.	Milk Yield. Total.	Percentage of Fat. Morn.	Percentage of Fat. Even.	Percentage of Solids not Fat Morn.	Percentage of Solids not Fat Even.	Points. Milk.	Points. Fat.	Points. Solids not Fat.	Points. Lactation.	Points. Deduction.	Points. Total.	Awards and Remarks.
							Lb. oz.	Lb. oz.	Lb. oz.											
2087	Mrs. B. A. Browell	Ryedale Silver	British Saanen	Feb. 13, 1931	Mar. 1, 1934	125	7 12	7 2	14 14	3·25	2·95	—	—	—	—	—	—	—	—	Disqualified
2088	J. R. Egerton	Malpas Melody	British Saanen	Mar. 10, 1930	May 16, 1933	414	5 5	4 13	10 2	4·80	4·30	8·80	9·00	10·12	9·24	3·60	5·40	—	28·36	Highly Commended Reserve for Chamberlain Cup
2089	J. R. Egerton	Malpas Myrtle	British Saanen	Aug. 1, 1930	Mar. 25, 1933	466	4 6	4 0	8 6	3·70	3·70	8·70	8·88	8·37	6·20	2·96	5·40	—	22·93	—
2093	Miss B. Farrer	Hargrave Foxtrot	British Saanen	Jan. 13, 1932	April 1, 1934	94	5 4	5 2	10 6	3·75	3·90	8·75	8·50	10·37	7·94	3·60	0·90	—	22·81	—
2094	Miss M. G. M. Madoc	Melvery Melican	British Saanen	Feb. 15, 1931	Jan. 12, 1934	173	4 14	4 10	9 8	3·80	3·80	8·72	8·34	9·50	7·22	3·28	2·20	—	22·20	—
2095	Mrs. Morcom	Cornish Renown	British Saanen	Feb. 2, 1929	April 2, 1933	458	6 3	5 5	11 8	3·15	3·40	8·60	8·75	11·50	7·52	3·96	5·40	—	28·38	Reserve, Chamberlain Cup, Reserve for Dewar Cup with No. 2159
2099	Dr. Maud Taylor	Radwinter Ruth	British Saanen	Feb. 17, 1932	April 9, 1934	86	5 2	5 4	10 6	3·45	3·50	8·68	8·28	10·37	7·22	3·48	0·70	—	21·77	—
2100	Dr. Maud Taylor	Ridgeway Repertory	British Saanen	Mar. 14, 1930	April 4, 1934	91	6 2	5 7	11 9	3·60	4·10	8·55	8·58	11·56	8·86	3·96	0·80	—	25·18	—
2101	Miss V. Walton	Dissington Marcella	British Saanen	April 24, 1931	April 14, 1934	81	6 4	6 4	12 8	3·40	3·85	8·88	8·68	12·50	9·08	4·40	0·60	—	26·58	—
2103	Miss C. Chamberlain	Whin of Westons	British Alpine	May 8, 1930	May 15, 1934	50	7 6	6 8	13 14	4·10	4·20	8·91	8·75	13·87	11·50	4·92	0·10	—	30·39	Third Prize, Abbey Cup
2104	J. R. Egerton	Malpas Millicent	British Alpine	April 23, 1932	May 25, 1934	40	5 5	4 10	9 15	5·10	4·40	8·50	9·78	9·93	9·48	3·60	—	—	23·01	—
2105	Miss Pope	Cornish Fealty	British Alpine	Jan. 30, 1931	Mar. 18, 1934	108	6 11	6 1	12 12	3·50	3·70	8·63	8·76	12·75	9·16	4·44	1·10	—	27·45	Highly Commended
2106	Mrs. W. A. Stirling	Didgemere Diriam	British Alpine	Feb. 10, 1931	Mar. 15, 1934	111	6 14	5 9	12 7	4·35	4·10	8·50	8·72	12·43	10·54	4·24	1·10	—	28·31	Highly Commended
2107	Mrs. W. A. Stirling	Didgemere Petunia	British Alpine	April 13, 1931	May 18, 1933	412	4 11	4 4	8 15	4·50	4·25	8·92	8·50	8·93	7·84	3·12	5·40	—	25·29	—
2108	Mrs. W. A. Stirling	Twinstead Tegus	British Alpine	Mar. 14, 1932	Mar. 13, 1934	113	4 0	3 12	7 12	4·50	4·40	9·35	9·50	7·75	6·90	2·92	1·20	—	18·77	Reserve for Abbey Cup
2112	J. R. Egerton	Hoveton Frailty	Anglo-Nubian	Feb. 5, 1931	Mar. 26, 1934	100	5 6	4 5	9 11	4·70	4·50	8·65	8·78	9·68	8·92	3·36	1·00	—	22·96	—
2113	J. R. Egerton	Malpas Merilees	Anglo-Nubian	Feb. 16, 1932	Feb. 4, 1934	150	5 1	4 7	9 8	4·90	5·75	9·30	9·11	9·50	10·06	3·48	1·80	—	24·84	Pomeroy Cup
2114	Mrs. M. E. T. Howden	Theydon Adelaide	Anglo-Nubian	Mar. 27, 1929	May 11, 1934	54	2 6	2 3	4 9	6·00	6·50	9·90	10·45	—	—	—	0·20	—	—	Disqualified
2116	Miss K. Pelly	Theydon Belle	Anglo-Nubian	Mar. 15, 1930	Mar. 25, 1934	101	5 2	4 10	9 12	5·30	5·15	9·24	8·75	9·75	10·18	3·48	1·00	—	24·41	Reserve for Pomeroy Cup
2118	Miss Alexander	Stockwell Bunty	British Toggenburg	Nov. 23, 1931	May 15, 1934	50	3 8	3 1	6 9	4·10	4·70	10·00	9·85	6·56	5·76	2·60	0·10	—	15·02	—
2119	Miss Alexander	Stockwell Harebell	British	Dec. 23, 1930	April 25, 1934	70	4 2	3 14	8 0	5·20	5·65	9·22	9·27	8·00	8·66	2·96	0·50	—	20·12	—
2120	Mrs. R. St. V. Bagnall	Fransham Forsythia	British	Feb. 4, 1931	Mar. 1, 1934	125	8 2	7 14	16 0	3·80	4·30	8·70	8·78	16·00	12·94 %	5·60	1·40	—	35·94	Second Prize, Reserve Dual Purpose Challenge Certificate
2121	Mrs. B. A. Browell	Feltham Frisky	British	Mar. 5, 1931	Mar. 27, 1934	99	9 0	8 15	17 15	3·80	3·80	8·70	8·63	17·93	13·62	6·20	0·90	—	38·65	First Prize, Dual Purpose Challenge Certificate
2122	Miss. C. Chamberlain	Wavelet of Westons	British	June 21, 1929	April 26, 1934	69	6 14	6 7	13 5	2·95	3·00	8·63	8·46	—	—	—	0·40	—	—	Disqualified
2124	J. R. Egerton	Malpas Magna	British	April 17, 1931	April 14, 1933	446	6 3	5 6	11 9	4·30	3·70	8·52	8·35	11·56	9·30	3·92	5·40	—	30·18	Fifth Prize, Dewar Cup with No. 2150
2125	J. R. Egerton	Malpas Magnolia	British	Feb. 8, 1930	Jan. 30, 1934	155	5 14	4 7	10 5	6·00	5·10	9·10	9·30	10·31	11·56	3·76	1·90	—	27·53	Highly Commended
2128	Miss B. Farrer	Hargrave Saintomer	British Toggenburg	May 18, 1929	Mar. 8, 1933	483	4 14	4 12	9 10	3·20	3·55	8·56	8·60	9·62	6·50	3·32	5·40	—	24·84	—
2130	Mrs. Morcom	Cornish Refrain	British	Jan. 22, 1931	Mar. 10, 1934	116	6 7	6 0	12 7	3·50	3·30	8·64	8·40	12·43	8·46	4·24	1·20	—	26·33	—
2131	Mrs. Morcom	Cornish Saccharine	British Toggenburg	Feb. 22, 1931	April 13, 1934	82	7 12	7 3	14 15	3·20	3·30	8·55	8·25	14·93	9·70	5·00	0·70	—	30·33	Fourth Prize
2132	Mrs. Morcom	Cornish Saint	British Toggenburg	Mar. 17, 1932	June 8, 1934	26	6 7	5 12	12 3	3·30	3·65	8·85	9·10	12·18	8·44	4·36	—	—	24·98	—

Table VI.—MILK YIELD CLASSES FOR GOATS AT IPSWICH, 1934—*continued.*

Class 249.—QUANTITY.

No. in Catalogue.	Exhibitor.	Name of Goat.	Breed.	Date of Birth.	Date of last Kid.	No. of days in Milk.	Milk Yield. Morn.	Milk Yield. Even	Milk Yield. Total.	Points. Milk.	Points. Lactation.	Points. Total.	Awards and Remarks.
							Lb. oz.	Lb. oz.	Lb. oz.				
2081	Miss Alexander	Stockwell Calsie	Toggenburg	Jan. 1, 1932	Mar. 13, 1934	113	4 0	3 14	7 14	7·87	1·20	9·07	—
2087	Mrs. B. A. Browell	Ryedale Silver	British Saanen	Feb. 13, 1931	Mar. 1, 1934	125	7 12	7 2	14 14	14·87	1·40	16·27	4th Prize
2088	J. R. Egerton	Malpas Melody	British Saanen	Mar. 10, 1930	May 16, 1933	414	5 5	4 13	10 2	10·12	5·40	15·52	Reserve
2089	J. R. Egerton	Malpas Myrtle	British Saanen	Aug. 1, 1930	Mar. 25, 1933	466	4 6	4 0	8 6	8·37	5·40	13·77	H.C.
2093	Miss B. Farrer	Hargrave Foxtrot	British Saanen	Jan. 13, 1932	April 1, 1934	94	5 4	5 2	10 6	10·37	0·90	11·27	—
2094	Miss M. G. M. Madoc	Melverley Melican	British Saanen	Feb. 15, 1931	Jan. 12, 1934	173	4 14	4 10	9 8	9·50	2·20	11·70	—
2095	Mrs. Morcom	Cornish Renown	British Saanen	Feb. 2, 1929	April 2, 1933	458	6 3	5 5	11 8	11·50	5·40	16·90	Third Prize
2099	Dr. Maud Taylor	Radwinter Ruth	British Saanen	Feb. 17, 1932	April 9, 1934	86	5 2	5 4	10 6	10·37	0·70	11·07	—
2100	Dr. Maud Taylor	Ridgeway Repertory	British Saanen	Mar. 14, 1930	April 4, 1934	91	6 2	5 7	11 9	11·56	0·80	12·36	—
2101	Miss V. Walton	Dissington Marcella	British Saanen	April 24, 1931	April 14, 1934	81	6 4	6 4	12 8	12·50	0·60	13·10	H.C.
2103	Miss C. Chamberlain	Whin of Westons	British Alpine	May 8, 1930	May 15, 1934	50	7 6	6 8	13 14	13·87	0·10	13·97	H.C.
2104	J. R. Egerton	Malpas Millicent	British Alpine	April 23, 1932	May 25, 1934	40	5 5	4 10	9 15	9·93	—	9·93	—
2105	Miss Pope	Cornish Fealty	Br tish Alpine	Jan. 30, 1931	Mar. 18, 1934	108	6 11	6 1	12 12	12·75	1·10	13·85	H.C.
2106	Mrs. W. A. Stirling	Didgemere Diriam	British Alpine	Feb. 10, 1931	Mar. 15, 1934	111	6 14	5 9	12 7	12·43	1·10	13·53	H.C.
2107	Mrs. W. A. Stirling	Didgemere Petunia	British Alpine	April 13, 1931	May 18, 1933	412	4 11	4 4	8 15	8·93	5·40	14·33	H C.
2112	J. R. Egerton	Hoveton Frailty	Anglo-Nubian	Feb. 5, 1931	Mar. 26, 1934	100	5 6	4 5	9 11	9·68	1·00	10·68	—
2113	J. R. Egerton	Malpas Merilees	AngloNubian	Feb. 16, 1932	Feb. 4, 1934	150	5 1	4 7	9 8	9·50	1·80	11·30	—
2118	Miss Alexander	Stockwell Bunty	British Toggenburg	Nov. 23, 1931	May 15, 1934	50	3 8	3 1	6 9	6·56	0·10	6·66	—
2119	Miss Alexander	Stockwell Harebell	British	Dec. 23, 1930	April 25, 1934	70	4 2	3 14	8 0	8·00	0·50	8·50	—
2121	Mrs. B. A. Browell	Feltham Frisky	British	Mar. 5, 1931	Mar. 27, 1934	99	9 0	8 15	17 15	17·93	0·90	18·83	First Prize
2122	Miss C. Chamberlain	Wavelet of Westons	British	June 21, 1929	April 26, 1934	69	6 14	6 7	13 5	13·31	0·40	13·71	H.C.
2124	J. R. Egerton	Malpas Magna	British	April 17, 1931	April 14, 1933	446	6 3	5 6	11 9	11·56	5·40	16·96	Second Prize
2125	J. R. Egerton	Malpas Magnolia	British	Feb. 8, 1930	Jan. 30, 1934	155	5 14	4 7	10 5	10·31	1·90	11·21	—
2128	Miss B. Farrer	Hargrave Saintomer	British Toggenburg	May 18, 1929	Mar. 8, 1933	483	4 14	4 12	9 10	9·62	5·40	15·02	H.C.
2130	Mrs. Morcom	Cornish Refrain	British	Jan. 22, 1931	Mar. 10, 1934	116	6 7	6 0	12 7	12·43	1·20	13·63	H.C.
2131	Mrs. Morcom	Cornish Saccharine	British Toggenburg	Feb. 22, 1931	April 13, 1934	82	7 12	7 3	14 15	14·93	0·70	15·63	Fifth Prize
2132	Mrs. Morcom	Cornish Saint	British Toggenburg	Mar. 17, 1932	June 8, 1934	26	6 7	5 12	12 3	12·18	—	12·18	—

MILK YIELD TRIALS.

GOATS, CLASSES 248 AND 249.

Once again Mr. T. W. Palmer took charge in this section. 31 goats competed and the results are shown in Table VI. "Gallon goats" are now the rule and not the exception.

THE WORKING DAIRY.

The work done here was the same as in recent years. Firstly, the turning of the milk produced on the showground into cream, and later into cream cheese and butter; secondly, the carrying out of the Milk Yield and Butter Test trials, an arduous business; and thirdly, the conduct of the usual Butter-making competitions, where we had more than 100 competitors. Seven teams competed for the County Championship, and I am grateful to the dairy staffs of Suffolk and Essex for pluckily responding to my urgent request that East Anglia must be represented; they were defeated, but not by any means disgraced, by the teams representing those counties where butter-making is a regular practice, and from which the great majority of competitors are always drawn. Cornwall won this event for the second time, with Monmouth second and Worcester third.

Miss Rosa Hancock from Devon won the Individual Championship, with Miss Marie Julian of Cornwall second and Miss Flossie Lewis, Monmouth, third.

In conclusion, after a year's absence through illness, it was a great pleasure to find the same staff still available in the Dairy, and once more I must thank them all for their unstinted support.

Amongst the ladies I must particularly mention Miss Noble, the chief dairymaid, and Lady Susan Hicks Beach and Miss Wood, who are unfailingly reliable in the responsible work of the butter-fat testing for the trials. A pleasant feature of the week was the presentation made by the Dairy Staff to Miss Freda M. Crawter, the Suffolk instructress, on the occasion of her approaching wedding.

Mr. R. Gubbins was, as ever, a willing and reliable second-in-command—no one could wish for a better; and I am also grateful to Mr. E. H. Walters for his help in the poultry tent, and to our dairy foreman, J. Bushell, whose keenness is only equalled by his invariable good temper.

Grange Hill, WILLIAM BURKITT.
Bishop Auckland.

CLASSES FOR BACON AND PORK PIGS AT THE IPSWICH SHOW.

THE classes for bacon and pork pigs, which were included in the Schedule for the 1934 Show, aroused a very considerable amount of interest. At the Derby Show in 1933, when classes for these types of pigs were introduced for the first time, they were judged only as live animals. At Ipswich, however, all the animals were slaughtered at the close of the Show, and the carcases were afterwards judged by the same judge who made the awards to the live pigs, acting in conjunction with the manager of a local bacon factory which had agreed to accept the pigs for bacon purposes under the Pigs Marketing Scheme.

In the first class, for two bacon pigs of any pure breed, not less than 200 lb. each live weight and not exceeding 230 lb., there were fifteen pens forward of which fourteen were Large White and one Welsh. All the live awards went to Large Whites.

In the corresponding class for first crosses between any pure breeds sixteen pens were forward, but three were disqualified on the ground of live weight. Of the remaining thirteen pairs, ten were crosses between the Large White and Large Black breeds, the others being crosses between the Large White on the one hand and the Wessex Saddleback, Essex, Welsh, Middle White and Gloucester Old Spot, respectively, on the other. Large White—Large Black Crosses secured all the awards except the Second and one High Commendation; the Second award went to Wessex Saddleback crosses and the High Commendation to Essex cross pigs.

The "Orwell Works" Champion Prize (Live Award) went to the first-prize pen of pure-bred Large Whites and the reserve to the winning pair of Large White—Large Black Crosses.

An additional champion prize was offered for the best pair of carcases as judged at the bacon factory. Here again pure-bred Large Whites were successful, the Reserve being a pair of Large White—Middle White Crosses and another pair of pure-bred Large Whites receiving a Commendation. The two sets of awards (live and carcase) were completely at variance inasmuch as no pen received an award in both cases.

The general remarks of the judges on the carcases were :—

(1) While both classes were good, the pure-breds showed, on the whole, more legginess than the crosses.

(2) The pair of pigs which won the Champion Award as carcases had been considered, when judged alive, to be rather

too short of body. When dressed, however, they proved so excellent in other respects that the judges placed them first, though the decision was not an easy one. The Reserve pair of carcases ran them very close indeed.

(3) Some of the pigs had made as much as 10–14 lb. live-weight increase between the initial weighing (before the opening of the Show) and the final weighing just before slaughter. The result of this was that several individual carcases exceeded the maximum weight (8 score 10 lb.) for Class I pigs under the Marketing Scheme. Such carcases could not be considered for the Champion Award. Some of these pigs had also, in all probability, increased in thickness of back fat to an undesirable extent.

(4) Taken all round the carcases showed that British producers could soon produce as good a type of pig as the most highly skilled of their overseas competitors.

It may be of some interest to analyse the grading, which was done according to the standards laid down under the Pigs Marketing Scheme. As regards belly thickness the results must be considered highly satisfactory, the 56 individual carcases being graded as follows :—

A	...	...	...	...	49
B	...	...	...	...	Nil
C	...	...	...	...	7
D	...	...	...	...	Nil
E	...	...	...	...	Nil

On the other hand, the grading on shoulder fat was, on the whole, low, and the commonest criticism of the Judge was "excess fat." The grades of the individual pigs as regards back fat were :—

A	...	...	...	...	4
B	...	...	...	...	Nil
C	...	...	...	...	26
D	...	...	...	...	24
E	...	...	...	...	2

In only one case were both members of a pair graded "A" on both measurements, and even in this case the carcases were cricitised on account of the oily nature of the back-fat. The contest thus confirms the general opinion that it is a matter of no little difficulty to attain the standard for a Grade A pig under the Scheme, and that it is difficult even for an expert to predict, from a consideration of the conformation of the live pig, the grade of carcase that it will yield.

In the porker classes there was excellent agreement between the live and the carcase awards. Thus in the pure-bred class the four pens which received live awards were also those that took the eye of the Judges in placing the carcases, though the order of placing was not the same. All four awards went to Large Whites. In the cross-bred class the First and Second Prize exhibits, alive, were again placed first and second, in the same order, as carcases. The top place in this class was taken by Large White—Middle White crosses, and the second by Large White—Large Black. The Judges remarked that the cross-bred porkers showed, on the whole, too much "finish" and were rather too heavy on the shoulder.

The details of weights, grades and awards are given in the subjoined tables.

CLASS 410.—TWO BACON PIGS OF ANY PURE BREED.

Show Entry No.	Name and Address of Owner.	Clip.	Live Award.	Dead Award.	Dead weight. sc.	Dead weight. lb.	Class.	Grade.	Measurement. in.	Killing Serial No.	Remarks.
3528	Stafford Allen & Sons, Long Melford, Suffolk.	1 Rump			8	8	1	DAD	31¼	360	Excess fat.
					8	6	1	DAD	31¼	361	
3529	H. R. Davidson, Common Lane, Batford, Harpenden.	1 Back	2		7	12	1	CAB	31	358	Slight deformity.
					7	7	1	CAB	30½	359	Lump of fat on left rump.
3530	H. R. Davidson, Common Lane, Batford, Harpenden.	Tail Clipped		Champion	7	18	1	CAB	31¾	356	Particularly well proportioned.
					7	18	1	CAB	31½	357	
3531	H. R. Davidson, Common Lane, Batford, Harpenden.	1 across Shoulder.	Reserved		7	12	1	CAB	30¾	354	Excess fat on rump.
					7	9	1	CAB	31½	355	
3534	Capt. R. S. Hall, New Hall, Tendring, Clacton-on-Sea.	1 Clip Top Top Neck.	3		7	7	1	AAA	31¾	352	1 pig excess fat.
					7	17	1	DAD	32½	353	
3535	James Lang, Home Farm, Hoxne, Diss, Norfolk.	1 Right Pin			8	1	1	DAD	30	350	Excess fat.
					7	17	1	DAD	29¾	351	
3536	A. E. Law, Newborough, Peterborough	1 Right Side			8	17	2	ACB	33¼	348	1 pig in Class 2.
					7	19	1	CAB	32	349	
3537	A. E. Law, Newborough, Peterborough	3 Right Side			9	1	2	CCC	33¾	346	Both pigs in Class 2.
					9	6	2	CAB	33	347	
3539	J. Pierpont Morgan, Wall Hall, Aldenham, Watford.	2 Left Side 1 Right Side.		Commended.	9	2	2	AAA	32¾	344	Large joints. Back fat, soft and oily. Both pigs in Class 2.
					8	12	2	AAA	33	345	
3540	R. Ewart Owen, Tanlan Hall Home Farm, Prestatyn.	Clip Right Shoulder.			9	4	2	DCD	31½	342	Excess fat. One pig in Class 2.
					8	6	1	DAD	31¾	343	
3541	Sir William S. Hyde Parker, Bt., Long Melford, Suffolk.	1 Clip Left Pin.	1st and Champion.		8	14	2	CAB	32¼	340	1 pig Class 2.
					8	4	1	DAD	31½	341	1 much thicker on shoulder than live appearance suggested.
3543	J. W. Roberts, Hill Farm, Hitchin Road, Shefford.	V Back	Highly Commended.		8	10	1	CAB	31¼	338	First pig fat on rump.
					8	4	1	CAB	31½	339	
3544	Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill.	1 Left Shoulder.			8	6	1	DCD	32¾	336	Excess fat.
					8	6	1	CAB	32¼	337	
3545	Col. C. J. H. Wheatley, Berkswell Hall, nr. Coventry.	2 Right Side			8	9	1	CAB	31½	334	Excess fat.
					8	1	1	DAD	31¾	335	
3547	Roy Worts, Bray Farm, Sutton, Norwich.	2 Right Pin	Highly Commended.		8	10	1	DAD	32	332	Excess fat.
					8	4	1	CAB	31	333	

Class 411.—TWO BACON PIGS, FIRST CROSS BETWEEN ANY PURE BREEDS.

Show Entry No.	Name and Address of Owner.	Clip.	Live Award.	Dead Award.	Dead Weight. sc. lb.	Class.	Grade.	Measurement. in.	Killing Serial No.	Remarks.
3548	H. R. Davidson, Common Lane, Batford, Harpenden.	2 Right Shoulder.	2		8 10	1	DAD	32	330	Excess fat.
					8 5	1	DAD	31¾	331	
3549	C. M. D. Gooch, Wivenhoe Park, Colchester, Essex.	2 Left Pin	Highly Commended.		8 6	1	CAB	30½	328	Rather short and one weak in streaks.
					7 17	1	CCC	30¾	329	
3552	Sir B. Greenwell, Bt., Marden Park, Woldingham, Surrey.	2 Left Side			8 4	1	DCD	30½	326	Excess fat.
					8 4	1	DAD	30¾	327	
3554	John R. Keeble & Son, Brantham Hall, Manningtree.	3 each Pin			7 19	1	DAD	30½	324	Excess fat.
					8 19	2	ECE	32	325	
3558	R. H. & R. Paul, Broxtead, Sutton, Woodbridge, Suffolk.	2 Middle Back.			8 12	2	DAD	31¼	320	Excess fat. One pig Class 2.
					8 2	1	DAD	31	321	
3560	R. H. & R. Paul, Broxtead, Sutton, Woodbridge, Suffolk.	2 Rump .			8 10	1	DAD	33¾	318	Excess fat. One pig Class 2.
					9 2	2	CAB	32¼	319	
3561	Mrs. A. S. Ruffell, Clipt Bushes, Cockfield, Suffolk.	2 Neck .	Highly Commended.		8 9	1	CAB	32	316	One in Class 2 and definitely thicker shoulder, otherwise nice pigs.
					8 13	2	CAB	32	317	
3562	Ruffell & Kent, Stour Hill, Cockfield, Suffolk.	3 Back .		Reserve Champion,	8 2	1	CAB	32¼	314	Although grades same as 1st Prize the carcases are not so compact.
					8 6	1	CAB	32¾	315	
3563	Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill.	Each Pin .			8 6	1	DAD	32	312	Excess fat.
					7 19	1	CAB	31¼	313	
3564	Alec J. Spinks, Northwold, Brandon, Suffolk.	Double V Back.	1st Reserve Champion.		8 6	1	DAD	32½	310	Excess fat.
					7 19	1	DAD	32½	311	
3565	G. Stedman & Son, Little Stonham, Stowmarket, Suffolk.	4 Clips Back	4		7 17	1	CAB	30¼	308	Fat rump.
					7 17	1	CAB	31	309	Pigs rather ripe.
3568	T. L. Ward, Cokhay, Repton, Derby.	Half Tail .	3		8 5	1	CAB	32	306	Excess fat.
					8 2	1	DAD	31	307	
3571	Col. Sir T. C. T. Warner, Bt., Brettenham Park, Ipswich.	5 Right Side			8 6	1	DAD	31¾	302	Excess fat.
					8 7	1	EAE	32	303	

CLASS 412.—TWO PORKERS OF ANY PURE BREED.

Show Entry No.	Name and Address of Owner.	Clip.	Live Award.	Dead Placing.	Dead Weight.	Measurement.	Killing Serial No.	Remarks.
					lb.	in.		
3574	Brig.-Gen. B. Atkinson, C.B., C.M.G., Mistley Hall, Manningtree, Essex.	1 Rump .			88 83	30 $30\frac{3}{4}$	298 299	Short, thick and too well finished.
3575	H. R. Davidson, Common Lane, Batford, Harpenden.	1 Back . .	2	4	88 83	$31\frac{3}{4}$ $32\frac{1}{8}$	296 297	Excellent carcases, rather short.
3576	H. R. Davidson, Common Lane, Batford, Harpenden.	Clip across Shoulder.	1	2	103 102	33 $33\frac{1}{2}$	294 295	Good type, little too well finished.
3579	Ernest Harding, Packwood Grange, Dorridge, Birmingham.	1 Right Pin .	Reserve	3	100 99	$33\frac{1}{8}$ $31\frac{1}{2}$	292 293	Excellent carcases, rather ripe.
3580	A. E. Law, Newborough, Peterborough	1 Right Side .	3	1	102 100	$24\frac{1}{4}$ 34	290 291	Excellent carcases well proportioned throughout.
3581	J. Pierpont Morgan, Wall Hall, Aldenham, Watford.	1 Top Neck .			103 105	$33\frac{1}{2}$ $33\frac{1}{2}$	288 289	Nice carcases but somewhat unfinished.
3582	R. Ewart Owen, Tanlan Hall Home Farm, Prestatyn.	1 Right Shoulder			103 98	$34\frac{1}{2}$ $33\frac{1}{4}$	286 287	Rather soft. 1 fat rump.

Class 413.—TWO PORKERS FIRST CROSS BETWEEN ANY PURE BREEDS.

Show Entry No.	Name and Address of Owner.	Clip.	Live Award.	Dead Placing.	Dead Weight.	Measurement.	Killing Serial No.	Remarks.
					lb.	in.		
3585	Brig.-Gen. B. Atkinson, C.B., C.M.G., Mistley Hall, Manningtree.	1 Left Pin	4		86 89	31¼ 33	284 285	Thick shoulders.
3586	H. R. Davidson, Common Lane, Batford, Harpenden.	1 Left Side			106 104	36¼ 35	282 282	Leggy and flanky.
3588	C. M. D. Gooch, Wivenhoe Park, Colchester.	1 Left Shoulder			99 98	33½ 32	280 281	Thick shoulders.
3589	Sir Bernard Greenwell, Marden Park, Woldingham, Surrey.	2 Rump			92 92	31 32	278 279	Thick shoulders.
3590	Sir Bernard Greenwell, Marden Park, Woldingham, Surrey.	Tail Clipped			72 79	30 30	276 277	Heavy fores.
3591	Ernest Harding, Packwood Grange, Dorridge, Birmingham.	2 Clips Middle Back.	Commended.		98 98	32¾ 32¼	274 275	Rather thick fores.
3592	John R. Keeble, Brantham Hall, Manningtree.	V Back			108 104	32½ 32¼	272 273	Thick shoulders.
3593	A. E. Law, Newborough, Peterborough.	1 Clip each Pin	1	1	96 92	33½ 30¾	270 271	Nice carcases, compact.
3594	H. Neaverson, Scotts Farm, Clinton, Peterborough.	2 Right Side			89 77	32 31¼	268 269	One nice carcase, one thick poll.
3595	R. Ewart Owen, Tanlan Hall Home Farm, Prestatyn.	2 Clips Shoulder	3		80 86	33 31	266 267	One heavy shoulder, the other better.
3596	R. H. & R. Paul, Broxstead, Sutton, Woodbridge.	2 Right Pin			91 90	31¼ 32	264 265	Heavy shoulders.
3597	Mrs. A. S. Ruffell, Clipt Bushes, Cockfield, Suffolk.	2 Left Sid			84 81	31¾ 29¾	262 263	Thick poll.
3598	Ruffell & Kent, Stour Hill, Cockfield.	3 Pin Left			95 93	31½ 32	260 261	One thick poll, one better.
3601	Alec J. Spinks, Northwold, Brandon.	2 Right Shoulder	2	2	80 86	31¼ 32	258 259	Nice carcases, one a little thick on shoulder.
3602	G. Stedman & Son, Little Stonham, Stowmarket, Suffolk.	2 V's Back			102 108	33¼ 34¼	256 257	Well proportioned and good carcases. Rather too heavy.

THE FORESTRY EXHIBIT AT THE IPSWICH SHOW, 1934.

THE Forestry Section at the Ipswich Show was of great interest the classes being well filled and containing excellent examples of the uses to which home-grown timber may be put.

The Earl of Stradbroke staged an exhibit of high educational value consisting of work done by estate craftsmen. This included, besides gates, farm carts, cabinet and inlaid work, some fine ornamental iron work and also bricks and tiles. Another praiseworthy piece of work from the same estate was a farm wagon, constructed in oak, ash and chestnut.

In the timber section, Class I, Lord Stradbroke showed excellent specimens of ash, beech and elm, though the oak board was not quite up to the standard of the others. Lord Stradbroke was first in the class for coniferous timber, and had another first for a collection of "other hardwoods," *i.e.*, excluding oak, ash, elm and beech. The collection included ilex, alder, chestnut, birch, maple, holly, acacia, sycamore, walnut and apple, and the outstanding specimens were those of walnut and alder.

There were six entries in the class for oak field gates, the first prize going to the Chatsworth Estates Company. The gates were very good, both in respect of the quality of the timber and the workmanship. I should, however, like to suggest to exhibitors that exhibition gates should be made of planed timber; given two specimens of otherwise equal merit a judge must naturally prefer a planed one to an unplaned.

The Chatsworth Estates Company had other first prizes for a gate in "any other home-grown wood" (*i.e.*, excluding oak), for a hunting gate and for a tree-guard. The medal for park and ornamental fencing went to Lord Stradbroke. The total number of entries in the Competitive section was thirty.

In the non-competitive section there were sixteen exhibits. The London & North Eastern Railway Company showed a 12-ton goods wagon, the underframe being in English oak and the floor in Scots pine. The Forestry Commission staged a very valuable exhibit illustrating the methods of protecting woodlands against fire; also a collection of implements used in planting and a plan of the layout of a typical forest-worker's small holding.

The University of Bristol staged a very instructive exhibit relating to the cricket bat willow. This included specimens of good and bad willow sets, examples of defects in willow trees, specimens of good and inferior bats and examples of the economic uses of the waste timber from bat making.

The Empire Forestry Association are to be congratulated on a very fine display of Empire-grown timber, the flooring and panelling being particularly admirable. The Royal Agricultural College, Cirencester, set up an exhibit to illustrate the heat-producing values of different qualities of home-grown timbers when used as firewood; and the Powell Duffryn Steam Coal Company showed the various stages of the process of manufacture of their wood-preservatives derived from coal tar.

The Chartered Surveyors' Institution arranged an exhibit illustrating the ornamental value of British hardwood timbers, including some very beautiful veneers and panels.

Sir Bernard Greenwell exhibited in this Section an Essex-type harvest wagon (which was drawn by his team of three Shire Horses in the competition for such teams in the ring during the time it was not required for Parades, etc.). The lorry was built by workmen employed on Sir Bernard's Surrey Estate from oak, ash and chestnut grown on his estate. The wagon was mounted on Timken roller bearings.

The collection of materials for these non-competitive exhibits must involve a large amount of work, and the exhibitors deserve thanks for their efforts in the cause of education.

Demonstrations were given in the crafts of wheel making, hurdle making, broom making and others involving the use of forest products.

THOS. ROBERTS.

Bellings,
Easebourne,
Midhurst.

REPORT OF THE JUDGES ON THE WOODLANDS, PLANTATIONS, AND ESTATE NURSERIES COMPETITION, 1934.

INTRODUCTION.

The competition was this year restricted to the Counties of Brecon, Cardigan, Carmarthen, Glamorgan, Pembroke, Radnor and Monmouth, an area of small residential estates where most of the woodlands are associated so closely with parks or gardens that their upkeep affects the immediate amenities of the owners.

Of the three estates which entered all their woodlands in Class VI, on only one did the woodlands run to more than 700 acres, and on the seven remaining estates which competed in other classes they were restricted in extent.

Most of the woodlands were shown to the Judges by the owners, who evinced a very live interest in management and silviculture. Moreover this interest is reflected in the plantations, every acre of which appears to have been carefully and intelligently thought out.

GENERAL OBSERVATIONS.

The plantations which were seen this year presented the greatest possible contrast to those which were entered in 1933.

In Lincoln, Nottingham and Derby the plantations are mostly mixtures of hardwoods and conifers, in which the hardwoods predominate and become the final crop; long rotations are anticipated and achieved, and the woods appear well stocked with maturing timber.

In South Wales the planter's interest is centred on pure crops of conifers, most of which are harvested at an age of less than forty years. Of 27 plantations which were judged, 18 were in Class II (a) (Conifers, 10 to 20 years old) and four in Class II (b) (Conifers over 20 years), while only one pure hardwood area was entered.

The predominance of conifers is largely due to the proximity of the mines, which absorb a considerable volume of locally-grown props. But there is also a climatic reason. The moist climate and high rainfall seem to suit conifers better than hardwoods, and the high elevation of some of the sites rules out the latter.

It is broadly true that throughout the Northern Hemisphere the seaboard forests are typically coniferous; the most striking example of this is the wonderful forest area on the Pacific slope of North America. Continental climates, on the other hand, lend themselves to broadleaved forest. Although the climate of the whole of Great Britain must be regarded as being oceanic in type, nevertheless there appears to be sufficient difference between the two sides of Britain to encourage the planting of good soils in the east with oak, ash, beech and sycamore, whereas near the western seaboard such soils respond so marvellously to fast growing conifers that the temptation to plant them is overwhelming. Sitka spruce, for example, which in the east is a tree for wet soils, is healthy and vigorous in the west on dry soils, either at high or low altitudes.

The growth of Japanese larch in particular was a great surprise to the Judges. Nearly every plantation of this tree reached the standard of Quality I of the British Yield Tables, and some of them far exceeded it. The growth seemed to bear a distinct relationship to the annual rainfall, the most remarkable results being obtained where the rainfall was highest. At Hean Castle, in Pembrokeshire, a plantation, 28 years old,

had an average height of 71 ft. (the mean Quality I height, at this age, of the British Yield Tables is 55 ft.), and one tree was measured with a height of 76 ft. and a quarter-girth at breast height of 11 in. On such trees the volume increment was still over 5 per cent. per annum, and there appeared no reason why their growth should not go on for many years.

Most foresters regard the Japanese larch as a tree which grows very rapidly in early youth, but is overtaken by European larch when 20 to 25 years old, and in dry climates this is no doubt the case. But there is evidence in South Wales that where the rainfall approaches 50 in. in the year, Japanese larch maintains its rapid growth for many years, and may be considered as a timber tree.

In moist climates, Japanese larch is an extremely cheap crop to establish. It may be planted wide, *i.e.*, at 6 ft. apart, with only 1,210 trees to the acre. Very few trees die, and usually no replacements are necessary. It grows so rapidly in the first few years that it soon gets away from competing weed growth, and needs very little cleaning. All the thinnings are valuable, and a remunerative thinning may be made as early as 12 years after planting.

It need occasion no surprise, therefore, that Japanese larch is becoming very popular in the west of England, and our only fear is lest the timber may not turn out to be satisfactory. It shares with European larch the reputation for lasting well out of doors, and for fencing material the two are equally good. For rustic work the thinnings are often preferred to European larch, as they are generally straighter and are free from canker. But the most important market for larch in South Wales is the coal mines, and growers are not yet quite satisfied that timber of the Japanese species has to the necessary degree those qualities which make European larch saleable.

Japanese larch has already been tested at the Forest Products Research Laboratory, and has been found to be not much weaker than European larch, though faster grown. It proved to be far stronger than Douglas fir, which has already been found acceptable in some mines. It would be worth while for the landowners of South Wales to have regular tests with Japanese larch carried out in the mines before extensive cultivation is continued much longer.

The price which is now obtained for larch pit props is not very attractive. On one or two estates where sales have recently been made, the standing price works out at about 4*d.* per cubic foot over bark. On the average Japanese larch should yield at least 3,000 cubic feet per acre in 30 years, which would be worth £50. The rate of compound interest earned on the capital

put into planting should therefore be about 5 per cent. free of income tax, which is enough to encourage owners to plant.

The marketing of pit props in the district is entirely unorganised. Each owner sells as best he can, and not infrequently the pit props travel an unnecessarily long distance in order to reach a particular colliery in which the owner has an interest.

South Wales should become an admirable centre for a trading branch of the new Home Grown Timber Marketing Association. It has in the collieries a very large market for larch, though the price is low. But it is expensive and troublesome for each individual owner to find his market, and if neighbouring landowners compete they will force the price to an unnecessarily low level. Owners would advance their own interests by agreeing to market through a co-operative trading organisation, the secretary or salesman of which would study the individual requirements of the collieries and meet demands in as sensible a manner as possible from the members' woods. He would also arrange transport and, since he could place large contracts, he would get better terms from the transport companies. A Branch of the Home Grown Timber Marketing Association, which has been formed in South Devon, is already operating in this way, and is obtaining good results.

Although the climate in South Wales favours conifers rather than hardwoods, there would be general regret if hardwoods ceased to be cultivated. They are indispensable to our best scenic effects, and their prominence can be secured without loss of income by reserving or planting them on the edges of coniferous plantations, where they can often remain for two or more coniferous rotations. These belts of hardwoods protect the conifers from wind and fire, and contribute by their leaf-fall to soil fertility.

An interesting infestation may be recorded. About the middle of May a plague of cockchafer beetles (*Melolontha vulgaris*) occurred in the Abergavenny and Monmouth districts. They came with an east wind and appeared in millions. The most noticeable damage to forest trees was the defoliation of the oak, which in some districts looked as though it had had a severe attack of the oak roller moth.

DESCRIPTION BY CLASSES.

Under the terms of the Schedule, plantations may be entered in any of the following classes :—

Class I.—Where hardwoods are intended as the final crop : (*a*) planted from 10 to 25 years ; (*b*) over 25 years.

Class II.—Where the final crop is intended to be conifers : (*a*) from 10 to 20 years ; (*b*) over 20 years.

Class III.—Where the final crop is intended to be a mixture of hardwoods and conifers: (*a*) from 10 to 20 years; (*b*) over 20 years.

Class IV.—For plantations of rarer conifers.

In Classes I, II and III plantations must be at least four acres in extent; in Class IV at least one acre.

In Class I (a) there was only one entry, for which the Bronze Medal was awarded to the Hon. Mrs. W. F. Roch. This plantation was a part of *Court Robert Wood* at Llanarth. An old wood of good oak standards over hazel coppice was felled in 1915, and a strong natural regeneration of oak resulted. Much of this was eaten by rabbits, but in 1917–18 the area was wired, and bare patches were planted with European larch and Sitka spruce. The better oak now averages about 20 ft. in height, and the conifers about 36 ft. The larch is cankered and is not covering the ground well, and it is the intention of the forester to cut it for pit props when it is 30 years old, and replant with beech which will help the oak to mature well. The Sitka spruce was planted in a wet area where oak would not prosper.

The results of cultivation in this wood are not what would be expected from the soil, which is a light loamy sand, impregnated with humus to six inches. This would encourage natural regeneration; but that such a soil should grow good oak but bad larch is worthy of remark.

In Class I (b) there was no entry.

Class II (a) was by far the most popular class, and was represented by eighteen entries. Most of these had more than one species, mixtures being more often by groups than individuals. The relative popularity of different species is shown by the following list of the number of plantations in which each occurred: Japanese larch, 11; European larch, 6; Scots pine, 4; Sitka spruce, 4; Douglas fir, 3; Norway spruce, 1.

The Silver Medal was awarded to Mr. Humphrey Peel, of Taliaris, near Llandilo, for *Warren Plantation.* This is an area of 6½ acres on a south slope at an elevation of 600 to 700 ft. The soil is a sandy loam, with good humus content. It was planted in 1919–20 with Japanese larch, partly at 4½ ft. and partly at 6 ft. spacing, with a belt of Austrian pine at the exposed northern edge. On the south side, separated from the plantation by a ride, is a line of old spreading beech, the leaves from which blow half-way across the plantation. In 14 years, the larch grew to an average height of 40 ft. at the bottom, and 36 ft. at the top of the plantation. (The average height for first quality of the British Yield Tables at 14 years is 33 ft.) The trees are straight, with small branches, and the larger ones are already 4 in. quarter-girth at breast height. In the more closely planted

section thinning is required, and it is only on this point that marks were lost. Brushing up in preparation for a thinning has already been done. This plantation is so near perfection that the Judges awarded to Mr. Peel the Gold Medal offered by the Royal English Forestry Society for the best plantation entered in the competition.

The Bronze Medal was awarded to Mrs. Gibson Watt, of Doldowlod, for *New Covert.* This is a plantation of 30 acres on an exposed hillside facing west at an elevation of 1,000 to 1,150 ft. The principal species is European larch, which was planted at 4½ ft. in 1923. At 11 years, the average height is about 13 ft. (Quality III of the British Yield Tables), which is satisfactory in view of the altitude and exposure. It will probably grow more rapidly when it has killed out the heavy weed growth of bracken, grass, bramble, etc. Japanese larch and Douglas fir of the same age have already smothered weeds, and are 16 and 14 ft. high respectively. Sitka spruce is 11 ft. and Norway spruce 7 ft. A 35-year old mixed wood at the top of the hill showed good growth of Douglas fir, European larch, Scots pine and Corsican pine. Altogether this entry was a splendid example of adventurous forestry under difficult conditions.

An additional Bronze Medal was awarded to Major J. A. Herbert, of Llanover, for *Mill Wood,* a level area of 10 acres at 320 ft. elevation, of pure Japanese larch planted at 4 ft. spacing in the spring of 1915. The mean height is 42 ft. (first quality). This wood was thinned in 1928, but should have been thinned twice since, and is now very crowded. The litter, which is matted and decomposing very slowly, would be helped by allowing sun heat to enter. The light loam on Old Red Sandstone is well adapted to the species, which is growing admirably.

Other plantations for which no award was given may be briefly described.

Plantations on the Beaufort Estate at Wentwood.—The general scheme of these plantations is described under Class VI. Here it must be noted that three plantations entered in Class II (a) all received high marks. They were *Hoël Devil Piece* (Japanese larch, 11 years), *Grey Hill* (Japanese larch, 10 years), and *Timothy* (Scots pine, 11 years). All these woods are Quality I or better, and are as good as young plantations can be expected to be; but as they have not yet been thinned or brushed up (Hoel Devil Piece, planted at 4½ ft., is ready for thinning), they have not yet qualified for distinction in such a well-represented class.

The Llanover estate at Abercarn, near Newport (Trustees of Llanover Estate), entered two interesting plantations. *Graig Glan Shon* has 10 acres of Japanese larch, 10 acres of Scots pine,

and 10 acres of Sitka spruce, all planted in 1924. The wood is situated on a very steep north-west slope at 500 to 1,000 ft. elevation, and the very broad rides running up the hill are bordered by beech belts as a fire protection. The soil is shale and gravel on Pennant rock, and contains a good proportion of humus. Owing to proximity to the mines, rabbits are kept down by poachers, and wire is unnecessary; but the mines are lowering the water table, and the drying out of the soil is having an adverse effect on the trees. As would be expected, Sitka spruce is most affected, but the other species also look rather unhealthy, and are attacked by larch aphis, Coleophora, Hylobius and *Tortrix buoliana.* Many parts of the wood, however, are clean, and a good crop of pit timber should ultimately be obtained in close proximity to the mines.

Graig y Chain is a plantation of Japanese larch on a very steep west slope at 800 ft. elevation. The average height at 14 years is 23 ft. in the better parts (Quality II), and though planted at 4-ft. intervals, it has not yet been necessary to thin.

In addition to *New Covert,* which received a Bronze Medal, Mrs. Gibson Watt, of Doldowlod, Radnorshire, entered three plantations in this class. Of these the best was *Dolyfan,* 10 acres of ten-year-old European larch growing on a steep south-west slope at 500 ft. elevation. The height of the dominant trees is 12 to 14 ft. (Quality II and III). *Trembyd Plantation,* 1,000 ft. above sea-level, is also 10 years old, and contains second quality European larch and some Scots pine. This is good growth at such a high elevation, but the trees are cankered, and are slow in conquering the grass and bracken among which they were planted. In *Crofty Plantation,* which is 12 years old, at an elevation of 750 ft., it can be seen that Japanese larch is far more efficient than European larch in killing out grass. The soil is a loam formed from siliceous shale, and good larch mixed with oak had been grown here; but the young crop of European larch is badly diseased and covered with lichen, a sign that it is not growing rapidly.

Captain H. A. Christy, of Llangoed, Breconshire, entered three plantations in Class II (a). *Plantation under Hughes's Wall* is 6 acres of Japanese larch with shelter belts of Scots pine and Douglas fir, all planted at 5-ft. intervals. It is on an east slope, 750 ft. above sea level, and the soil is a sandy clay which cakes in wet weather. At 11 years old the larch is 20 to 28 ft. high (mostly Quality I). The land had previously carried a very good crop, principally of larch and wych elm, and gaps in the young plantation have become filled with natural ash, sycamore and oak. *Stockley Bank* is on a similar slope, and contains fair-sized plots of Douglas fir, Sitka spruce, Japanese and European

larches, with some very useful natural ash. These plantation were made in 1921–22 on an area which had been felled some years previously. The Japanese larch, Douglas fir and ash are the most promising species, and a failure, where both larches are dying back and nettle and other weeds are rampant, was ascribed to rooks having used the old wood at this spot as a rendezvous.

Court Robert Wood at Llanarth, Monmouthshire, the property of the Hon. Mrs. Roch, has an interesting section of 6 acres which was planted in 1917–18, with Norway and Sitka spruce in alternate lines at 4-ft. spacing. The Sitka spruce is 32 ft. (Quality II) and the Norway spruce 28 ft. (good Quality I), and there is little doubt that the former will make the final crop. This is an unusual experiment which provides useful information, but the usual practice to-day of planting Sitka pure at 5 to 5½ ft. is to be preferred.

Finally, we must record *Held Wood* at Ffrwdgrech, Brecon, owned by Captain J. D. D. Evans, M.F.H., which has very exceptional features. On an area of 8 acres, with a north aspect at 800 ft. elevation, diseased larch with scattered hardwoods were felled, and re-planting was done in 1917–18 with pure Douglas fir, Douglas and Thuya, and European larch and Thuya. In spite of close planting the Douglas, which was damaged by wind in 1927, is rough, and the chief interest centres on the mixed larch and Thuya, in which the latter is standing the shade of its taller neighbour and is improving the soil. The Thuya also yields an income through the sale of "greenery."

In Class II (b) : *Conifers over* 20 *years.*—The Silver Medal was awarded to Captain J. D. D. Evans, of Ffrwdgrech, for *Wernddn Fernbank*, 7 acres of European larch planted in 1913–14. Like the last, this is situated on a north slope at 800 ft. elevation, for which altitude its growth of 43 ft. in 20 years is extraordinarily good. It has been helped by belts of beech 10 yards wide and almost 100 yards apart, which were planted across the direction of the prevailing wind. The beech leaves have blown across the intermediate larch and greatly improved the mixture of litter. This method of mixing beech with larch is better than planting them in groups, and it may be possible to leave the beech standing through several coniferous rotations. This wood has been thinned twice, but still has about 1,000 trees per acre, which should be reduced to 750 this winter.

The Bronze Medal was awarded to His Grace the Duke of Beaufort for *Lodge Well* at Wentwood, Monmouthshire. This is 15 acres of European larch planted in 1912–13 on a light sand at 900 ft. elevation. The average height is about 35 ft. (Quality II), and there is still a heavy weed growth underneath. Thinning

has reduced the number of trees to 800 per acre, and the density is good. Mr. Davies, the manager of the wood, has secured a profitable market for his thinnings, and it is this that has enabled him to thin. It so often happens that good silviculture is built up on good marketing. *Lower Lodge*, another section of the same wood, is Japanese larch of the same age as the last, but 52 instead of 35 ft. high. This growth is very good indeed, but the plantation is very much in need of thinning.

Clawdd Wood (the Hon. Mrs. Roch), at Llanarth, contains 4 acres of 23-year-old Corsican pine. The average height of this is about 40 ft., which is super-first quality, but the stems are so thick on the ground (there are in places 1,800 to the acre) that the crowns are unduly small. Were it not for the high density, this would be a very nice plantation.

In Class III (a): *Mixed hardwoods and conifers*, 10 *to* 20 *years*, no award was given. There was only one entry, viz., *Penylan Wood*, also on the Llanarth estate. On the selected 4 acres of this wood there are planted oak, chestnut, and larch, and natural sycamore and ash coppice. The age is 19 years. The larch has grown extremely fast, being in places 50 ft. high, and has swamped everything with it. The oak and chestnut were mixed with Scots pine, which died out, leaving the hardwoods so widely spaced that they are rough. It was suggested that the larch should be cut for pitwood, and that most of the wood should be underplanted with beech to give a pure hardwood area.

In Class III (b): *Mixed plantations, over* 20 *years*, there were two entries. The Silver Medal was awarded to Lord Merthyr for *Errox Wood* at Hean Castle, Pembrokeshire. This wood was planted in 1906 in a valley running south at low elevation near the coast, where the rainfall is very high. Japanese larch, which is the principal species, has an average height of over 70 ft., and individual trees were estimated to measure 27 cubic feet over bark. There was also some Scots pine and the hardwoods consisted of ash, a Turkey oak belt on the east side, and natural sycamore and wych elm. A wood in which Japanese larch grows at this rate can only be maintained as a mixture if the species are growing in groups. Here this is the case, and the larch are in irregular clusters among a matrix of hardwoods. The hardwoods are being drawn up, and, though their shape leaves much to be desired, they are young and vigorous, and should give some good timber. The soil is a light sandy loam on shale, and does not appear very fertile.

A part of *Taliaris Wood* in Carmarthenshire (Mr. Humphrey Peel) was also entered in this class. This is 7 acres of ash, larch, and a few sycamore and spruce, about 44 years old. The

conifers were planted at wide spacing and the hardwoods were self-comers, and it is the latter which have done best. The density is only half what it should be, but the wood may improve with further growth.

No award was given in Class IV, *for rare conifers*, though there was one interesting entry. This was a plantation belonging to Captain A. M. Talbot-Fletcher, on the sand dunes near Port Talbot. The system of fixing sand dunes with marram grass has been practised on this estate for many years, and successful plantations of Corsican pine have been reared, greatly to the advantage of the neighbouring meadows which they protect. Corsican pine, 34 years old, was 36 ft. high, and though this only represents 3rd quality growth, it is a triumph on such a sterile soil. Maritime pine has also been tried, and though it was found difficult to establish, some good groups were seen. Though the Judges were unable to award a medal for Corsican pine in this class, and there was not the required acre of Maritime pine, this plantation provided a great deal of interest. They were shocked to see rabbits allowed into young plantations for sporting purposes.

In Class V, *for estate nurseries*, there was no entry.

Class VI, *for the best-managed woodlands on an estate of not less than* 1,000 *acres*, provided, as usual, some very interesting entries. The Silver Gilt Medal was awarded to the Duke of Beaufort for his estate at Wentwood, which, in the experience of the Judges, is quite unique. Much of the surrounding estate has been sold, but 1,503 acres of woodland in a single block remain. They were covered with oak and beech coppice, which has gradually been sold for pitwood through Mr. A. H. Davies, a timber merchant of Usk. But as Mr. Davies has a love for trees growing as well as trees felled, and as he had bought an adjoining area which he was planting, he came to an agreement with the Duke by which he undertook to manage the re-planting of any areas which he felled. Under this agreement he has planted 640 acres of the Duke of Beaufort's woods since 1921, and, as about 190 acres had been planted before, more than half the area is covered with young, actively-growing crops. The view from high ground of this vast area of plantations would warm the heart of any forester.

What even more excited the admiration of the Judges was Mr. Davies's system of management. Not having been through the orthodox training of foresters, he started without any of their orthodox inhibitions. When he began, the wood was full of rabbits, and most of us would have thought that wire netting was essential. But Mr. Davies, after reducing their number by encouraging poachers, disposed of most of the rest by inviting a

pack of beagles to work the wood regularly. The beagles are followed by ferreters, who trap the rabbits run to earth. And the workmen in the woods, seeing that it is no longer worth while to leave a few to breed, have practically finished them off. So there is no wire, and extremely little rabbit damage was seen.

On an average, eight men are employed in the wood for felling, burning, planting, cleaning and thinning. The cost of planting, including plants and clearing up the refuse from felling, is only £7 per acre, and subsequent cleaning costs £3 in three years. Anyone must admit that this is a very low cost for planting up old woodland, and yet the plantations are very satisfactory, and a very high average of efficiency is maintained.

The work that Mr. Davies is doing is a very remarkable example of economic forestry. He is building up a great capital asset at very small cost, and his work unquestionably merits the Silver Gilt Medal.

The Silver Medal was awarded to Captain H. A. Christy, of Llangoed, Breconshire. Captain Christy's woods extend to 448 acres, mostly situated on the Old Red Sandstone. About 200 acres of woodland felled during the war have been re-planted since 1921, and these areas are recorded on maps which also indicate the owner's policy for the future. An accurate register of sales and costs has been kept.

Many interesting plantations were seen in addition to those which were entered in Class II (a). In particular, Warren Plantation, on the sides and shoulder of a hill at 700 ft. elevation, contained, in addition to Douglas fir, Sitka spruce and Japanese larch, *Pinus Banksiana* which is 25 ft. high fifteen years after planting and still growing, and white spruce which is 4 to 5 ft. high in six years and looking very healthy. Sitka spruce adjoining is about the same height.

In Bwlch Larch Plantation, which is 29 years old, European and Japanese larch were intimately mixed. The latter now stand at 10 ft. by 10 ft., and it appears that they were formerly inter-spaced with the European species, so that the planting distance was 5 ft.; but nearly all these have been removed in thinnings. This is a mixture we should have been slow to recommend, but the result is very fine, for the wood contains about 70 tons of pitwood to the acre, which, even at the low price of 12*s*. per ton standing, is worth £42 per acre, and yields a return of almost 5 per cent. compound interest, free of tax, on the cost of planting. Moreover some valuable thinnings have been taken. The thinnings in this case must have been easy to select, but the punctuality and the high standard of thinnings in other woods prove Mr. Wilson, the forester, to be a thinning expert.

Cultivation for amenity was represented by the Dingle, a beautiful growth of ash, larch and azaleas, and a silver fir in the

garden was estimated to be 125 ft. high. An estate sawmill provides timber for estate repairs.

The Bronze Medal was awarded to Mrs. Gibson Watt for the woodlands at Doldowlod, Radnorshire. These woods extend to 650 acres, of which about 130 acres have been re-planted since 1922 to replace war fellings. The chief demands made on the woodlands on this estate are for shooting and amenity, despite which most of the young plantations are coniferous, the principal species being the two larches, Sitka spruce, Douglas fir and Scots pine. A few hardwoods—oak, sycamore and sweet chestnut—are sparingly mixed with them.

Big Wood presented a special problem. About 26 acres of mixed wood (oak, chestnut, sycamore, ash, silver fir and Norway spruce) is mature, and would be felled and re-planted were it not on a hill rising immediately behind the house. The wood is very gappy, and the trees are too widely spaced to pay for their keep or to make satisfactory growth. Such a wood should be managed on a selection system, but it would be necessary to exclude rabbits, and to help natural regeneration by judicious planting.

New Covert, Dolyfan Plantation and Grofty have already been described under Class II (a). Trynlone Wood is 10 acres of good straight oak, about 100 years old, and a group of Douglas fir 100 ft. high shows how well the area is adapted to this species. Cefncoed Wood ($3\frac{1}{2}$ acres at 560 ft.) was planted in 1914 with Douglas fir and Japanese larch, the former being intended as the final crop. They were, however, planted at $4\frac{1}{2}$ ft., and the precocity of the larch has given it a lead from which the Douglas fir will probably not recover. The larch is 42 ft. high in 20 years.

The sawmill cuts timber for estate purposes, and is worked two or three days a week. The source of power is a 16-h.p. Ruston-Hornsby oil engine, which runs a 42-in. saw. Gates are made and estate repairs carried out.

Judges { JOHN ADAMSON.
W. E. HILEY.

REPORT OF THE JUDGES OF THE ORCHARDS AND FRUIT PLANTATIONS COMPETITION, 1934.

THE area covered by the R.A.S.E. Orchards and Fruit Plantations Competition in 1934 was the East Riding of Yorkshire, the counties of Lincoln and Norfolk, and the Isle of Ely. A total of 29 entries was received from 17 growers. This is disappointing as compared with 70 entries in the previous year, when the competition was held in Berkshire, Surrey, Sussex and Kent, and with 55 entries in 1932, when it included Cornwall, Devon, Somerset, Dorset, Wiltshire, Hampshire and the Isle of Wight. Possibly the fact that growers were facing a second successive season of severe drought discouraged some from entering their plantations.

Of the total number of entries no fewer than 26 were received from Norfolk and only one each from Lincolnshire and the Isle of Ely. There were no entries from the East Riding of Yorkshire. The Wisbech district, which is important as a horticultural area, was represented by only two entries.

Judging was carried out during the second and third weeks of June, shortly before the picking of strawberries began in the district. No carefully-planned itinerary was needed, since most of the plantations could be reached with reasonable ease from Norwich, which served as a base throughout the judging. Valuable assistance in locating the plantations and arranging the visits was rendered by the horticultural officers of the counties concerned.

The score card adopted for the pointing of top fruits, in Classes 1 to 4 inclusive, was in use for the first time. It was drawn up by Mr. J. F. Goaman, one of the judges in last year's competition, who considered that some revision of the score card previously used was desirable, mainly in order to give a clearer indication of the principles upon which the orchards and plantations are judged and to make a more useful guide to intending competitors. The revised system of pointing was found to serve its purpose very well, though it seems somewhat strange that it should omit to allot points for cropping or productiveness. This important feature was considered under (*h*), Physiological condition of the trees, as was probably intended. Section (*e*), Similarity of management, was taken as indicating the ability of the varieties in the plantation to stand

similar treatment in the way of spraying, dusting and manuring. Details of the new score card are given below :—

- TOTAL 100 points.
  - Planning. 40 points.
    - Site and Layout. 20 points.
      - Distances of Planting. 10 points (*a*).
      - Layout in reference to tree protection, wind-breaks, headlands and cross-roads, water supply, air drainage, morning sun and storage facilities. 10 points (*b*).
    - Selection of Varieties. 20 points.
      - Value for market purpose in view. 10 points (*c*).
      - Value as Pollinators. 5 points (*d*).
      - Similarity of management (*e.g.*, effect of sprays). (Marks might be allowed for *complementary* value, *e.g.*, upright filler-pollinator in widespread varieties.) 5 points (*e*).
  - Management. 60 points.
    - Pest and Disease Control. 30 points.
      - Pest and Disease Control. 30 points (*f*).
    - Tree Control. 30 points.
      - Shape and pruning in reference to productiveness and management. 10 points (*g*).
      - Physiological condition of the trees. (This involves all soil and/or grass management and manurial practices.) 20 points (*h.*)

No alteration was made in the score cards used for judging bush fruits and strawberries, points being awarded as follows :—

Bush fruits, Classes 5 to 7—

15 (*a*) System of planting.
10 (*b*) Pruning and shape.
20 (*c*) General vigour and productiveness.

20 (*d*) Freedom from pests and disease.
10 (*e*) Land Management, including manurial control.
10 (*f*) Selection of varieties.
10 (*g*) Economical and commercial aspect.
5 (*h*) General appearance.

100

Strawberries, Classes 8 and 9—
10 (*a*) System of planting.
5 (*b*) Strawing.
15 (*c*) General vigour and productiveness.
25 (*d*) Freedom from pests and disease.
15 (*e*) Cultivation and manurial control.
10 (*f*) Selection of varieties.
10 (*g*) Economical and commercial aspect.
10 (*h*) General appearance.

100

The following awards were made :—

CLASS 1.—Open to growers of apples and pears. Best managed plantation or orchard planted not less than 8 years, of which not less than 5 acres must be entered. (4 entries.)

First (96 points). A. R. Garner, Three Holes, Wisbech.

This is an orchard of trees of bush form on about 3-foot stems, stated to be probably on Malling No. 1 stock. The soil ranges from silt to clay in different parts of the area and was the heaviest encountered in the course of the competition. Wisely, for this soil, the varieties are confined to the culinary class. The layout has been well considered. Trees of " Bramley's Seedling " stand at 36 feet on the square, interplanted with " Grenadier " and " Emneth " at 18 feet. They are so arranged that, when alternate trees have to be removed to allow space, there will still be room for one pollinator to remain in the centre of the square between four trees of " Bramley ". At 16 years from planting the trees are just beginning to fill the available space, and the question of sacrificing any of them will not arise for a few years.

A full programme of routine spraying is adopted, and it has been most successful in controlling pests and disease. Winter spraying with tar-oil wash is followed at the delayed dormant stage by the application of 5 per cent. petroleum emulsion for the control of capsid and red spider. Two pre-blossom sprayings with lime-sulphur are given to start the campaign against scab, and the trees had already received two post-blossom applications of the same fungicide. Arsenate of lead is added to the lime-sulphur at the pink-bud and petal-fall stages to kill caterpillars ; and there had been the further addition of nicotine after blooming to deal with apple saw-fly.

With regard to manuring, the orchard has undergone a course of potash treatment for the last six years, and ground phosphates are given now and then. Nitrogen is supplied, as called for by the condition of the trees, in the form of pig manure or sometimes fish meal. As a result of this feeding the trees are in full vigour and are stated to have cropped consistently for the last six years, reaching the maximum in 1933. This season they are carrying a heavy crop of clean fruit, quite free from scab.

Cultivation is efficiently maintained by means of a rotary machine. The gooseberries still retained as an undercrop can now hardly be worth while. They would be better out of the way to allow more freedom of movement for cultivation and spraying.

This orchard was an outstanding winner in a moderate class.

Second (84 points). Westwick Fruit Farm, Westwick, Norwich.

An orchard of pears and just a few apples planted diagonally at 15 feet each way. The pears are chiefly "Conference" with "Fertility", "Doyenné du Comice" and "Dr. Jules Guyot" as pollinators. The trees are of bush form on short stems, and skilful training during the early stages has produced shapely specimens well furnished with nicely-spaced branches. The pruning is well done.

The soil is the sandy loam typical of the district, but there is unfortunately a bad patch of land on which the trees do not thrive and remain far below the general level of the plantation.

The control of insect pests is sufficient, though there were traces of aphis, caterpillars, and pear leaf blister mite. Scab was not quite adequately suppressed and could be found on some of the leaves and occasionally on the fruit. The trees had been sprayed with tar-oil wash during the winter and with Bordeaux mixture once before and again after blooming. For the remainder of the season dusting with copper-lime is relied on to keep down scab. A better control of this disease would probably be obtained if an additional application of fungicide were made before blooming.

The orchard is under clean cultivation and had received a dressing of a wool manure. It was carrying a moderate crop after a heavy yield last year.

Reserve (80 points). T. R. C. Blofeld, Hoveton Home Farm, Wroxham, Norfolk.

A 13½-acre orchard of "Bramley's Seedling", 30 feet apart, interplanted with "Worcester Pearmain", "Lord Derby" and a few "Monarch", at 15 feet. Unfortunately the filler trees are on "crab", and are therefore likely to grow too big and to be in their prime when they have to come out in order to give the "Bramleys" space.

The trees have been well pruned and are nice specimens, and they were carrying a moderate crop; but the schedule of spraying adopted is evidently not sufficient to give a good control of pests and diseases. Although the trees had received two applications of lime-sulphur, one before and one after blooming, many of the leaves were already yellow as a result of red spider infestation, and there was a good deal of powdery mildew to be seen as well as a little scab. A considerable proportion of the apples had been gnawed by caterpillars. The "Worcesters" had been sprayed with nicotine after petal-fall for the control of saw-fly—with good result. The orchard was winter sprayed with tar-oil and was to receive further spraying with lime-sulphur.

The alleys between the rows are ploughed in winter, and the ground is cultivated in two directions in spring and early summer. This leaves a small square of grass around each tree which is usually mown, but this year was being scraped off. This work had not been completed at the time of inspection, and the grass round the stems of some of the trees was long.

With closer attention to spraying and more timely cultivation this should be quite a nice orchard.

Class 2.—Open to growers of apples and pears of less than 10 acres. Best managed plantation or orchard planted not less than 8 years, of which not less than 2 acres must be entered. (3 entries.)

First (95 points). J. W. Burrows, North Brink, Wisbech.

It was a pleasure to walk into this little orchard of 5 acres, of which 3 acres were entered for the competition, and to find that every attention had been given to the trees, just as it would be on a large, well-managed fruit farm. The stems had been banded with sacking to trap apple blossom weevil. In winter part of the orchard was sprayed with tar-oil wash at 10 per cent., followed by petroleum emulsion at 7½ per cent. at the delayed dormant stage; and the rest had received instead a Long Ashton two-solution winter wash. Both treatments had been successful in controlling capsid, very little of which could be found. Two applications of lime-sulphur had been given before blooming. After petal-fall use was made of an "omnibus" wash consisting of lime-sulphur, arsenate of lead, nicotine, and a spreading agent. As a result, scab appeared to have been completely suppressed and an excellent control obtained of saw-fly and caterpillars. There was a little silver-leaf on "Emneth".

The trees are of bush form on 2-foot 6-inch stems, planted 18 feet × 15 feet on medium to heavy silt soil. The varieties are "Newton Wonder", "Emneth", "Allington Pippin", "Grenadier", "Bramley's Seedling", and "Lord Derby". Some good examples of "Cox's Orange Pippin", top-grafted on "Allington Pippin", were observed.

Pruning has been well adapted to the needs of the different varieties, the trees being kept nicely open without going to the extreme of senseless "skeletonising". They are full of vigour and carrying a heavy crop.

The land has been grassed down this year on the advice of the judges in some previous competition, doubtless with the idea of preventing the trees from outgrowing the available space. The grass is to be mown and allowed to rot into the ground, a plan which should answer well on this soil provided that nitrogen starvation is guarded against.

Second (90 points). W. McDowell Gould, Mill Hill Gardens, South Walsham, Norwich.

The first impression of this orchard, gained from the road, is not encouraging, as the lay-out does not give an attractive appearance. On close inspection, however, it turned out to be so healthy and well cared for, and so productive of fruit that will obviously be of high quality, that it could not be denied an award.

The trees are apples in bush form, planted in rows of 24 feet apart, but unfortunately spaced at only 12 feet in the rows. After 14 years they are, in many cases, growing into one another. The intention is to remove alternate trees, leaving a 24-foot plant; but it is to be feared that the sacrifice will be long delayed. Filler trees should always be on a very dwarfing stock. The spaces between the rows are intercropped with red currants, sugar-beet, flowers, etc.

The orchard is nicely situated on sloping land, which must make for good air drainage. The soil is very light, and it is said that pure sand is very close underneath. In these conditions leaf scorch was troublesome, but it has been cured by applying potash five years in succession.

The varieties are "Norfolk Beauty", "Bramley's Seedling", "Beauty of Bath", "Ellison's Orange", "Allington Pippin", "Emneth", "Grenadier", and a few odds and ends—too many for an orchard of 4 acres which supplies fruit, not for local sale, but for disposal through salesmen in distant markets.

The control of pests and diseases is remarkably good. It is obtained by the use of tar-oil wash in winter, two pre-blossom applications of lime-sulphur, and two post-blossom. Arsenate of lead is added both before and after blooming, and nicotine also at the right time after petal-fall to control saw-fly.

The trees were carrying a heavy crop of fruit which promised to be of high quality. "Emneth" and "Grenadier" had received a dressing of nitrate of soda, an example of suitable differential manuring.

Reserve (89 points). Lt.-Col. G. E. Todd, Mundham House, Brooke, Norwich.

A 2½-acre orchard of "Bramley's Seedling" standards, planted diagonally at 36 feet. They are fine trees and have been well shaped, but have been planted without pollinators. There is an old orchard of other varieties on land adjoining at one end; but this is taking a chance which can hardly fail to tell against good fruit-setting in a season when pollination conditions are unfavourable. This year the set is heavy, but it appeared to be most abundant close to a tree of "Ellison's Orange" standing near the top of the orchard. Another risk had been taken in pest and disease control. The use of a tar-oil winter wash was the only spraying done, the trees having been grease-banded in addition. Red spider was very evident in parts of the orchard, and a little scab could be found which might easily have become more serious in suitable weather conditions in the absence of any control measures. Spraying with lime-sulphur would have been well worth while to suppress these two troubles.

Class 3.—Open to any grower of plums, cherries, or damsons. Best managed plantation or plantations planted not less than 8 years, of which not less than 2 acres must be entered. (1 entry.)

Second (84 points). Westwick Fruit Farm, Westwick, Norwich.

A 13-acre orchard of cherries, planted 30 feet apart, 25 years ago, on what is locally considered to be a thin soil over sand. A flourishing specimen of wild cherry found growing close by suggested that the crop could be grown on this land, which otherwise might have been considered unsuitable. The natural deficiency of lime was corrected during the early years of the orchard.

The varieties are "Early Rivers", "Waterloo", "Early Amber" and "Napoleon Bigarreau", with a few trees of other kinds introduced to assist pollination.

This is a good cherry orchard, but this season was not looking quite up to first prize form. The trees had a "tired" appearance, the effect of a heavy crop last year, when little growth was made during the severe drought. The grass was not in the closely-grazed condition that one expects to see under cherries. It had received a dressing of a compound fertiliser, and sufficient sheep to keep it down were not available early enough in the season. The trees were carrying a light to moderate crop. They had been grease-banded and sprayed with tar-oil wash and lime-sulphur; but a little aphis and caterpillar damage could be seen besides a certain amount of blossom wilt.

Class 4.—Open to any grower of apples or pears. Best managed plantation or plantations planted not less than 4 years and not more than 8 years, of which not less than 2 acres must be entered. (3 entries.)

First (92 points). W. D. Everington, Hill Farm, Great Dunham, King's Lynn.

This is an interesting case in which a general farmer has turned to fruit-growing because of the depression in agriculture, and seems likely to make a success of it.

The soil is clay loam over chalk, and there is no doubt that apples can be grown on it very well. The trees, ranging from the fifth to seventh year from planting, are already coming nicely into bearing, and yet have grown freely and made good specimens. Pruning has obviously been carried out on sensible lines to achieve this result. "Cox's Orange Pippin" (on No. II stock) and "Ellison's Orange" (on "crab") are bearing full crops, and "Bramley's Seedling" (also on "crab") has made a start.

The "Bramley's" have been planted 32 feet apart each way, which will give them nice space for development. The dessert varieties have the same distance between the rows, but are 16 feet apart in the rows. This is a fault in lay-out, because the alleys, in this case, will always be too wide and will have to be intercropped. At present there are black currants under all the trees. The apples share the farmyard manure, given to the black currants, and, in addition, have received a 3 or 4 years' course of potash applications.

In spite of the fact that water for spraying has to be carted, a full programme had been carried out with excellent results. Scab has hitherto been the chief enemy in this orchard, but had been well controlled this year. Tar-oil wash was used in in the winter, lime-sulphur at the "mouse-ear" stage, and lime-sulphur with arsenate of lead at the pink-bud stage. After blooming, recourse was had to one of the combined washes consisting of lime-sulphur, arsenate of lead, nicotine, and a spreading agent, recommended by the Long Ashton authorities for the control of apple sawfly, scab and caterpillars. The control of scab is continued during the season by sulphur dusting.

One of the small motor cultivators would be an advantage for use close to the trees, as there had been some damage to overhanging branches by horse work.

Second (91 points). S. C.-H. Boardman, How Hill Farm, Ludham, Great Yarmouth.

A promising plantation of bush "Conference" pears on Angers A stock, planted 5 years ago at 12 feet apart each way. No pollinators have been included, which is unwise even for a self-fertile variety like "Conference". Suitable varieties for this purpose would be "Dr. Jules Guyot", "Marguerite Marrilat", and "Doyenné du Comice". Training, on the whole, has been well done, though some of the trees need a few more main branches to make the plantation uniform and fully productive.

The plantation had been dressed with farmyard manure and potash, for the sake of both the pears and the under-crop of gooseberries. We received the impression, from both crops, of something just a little lacking in nutrition, possibly lime; but it may have been merely the effect of drought and a severe hail-storm that had been experienced.

The trees were free from scab, but showed a little pear leaf blister mite. They had been sprayed with tar-oil wash in winter and arsenate of lead in spring.

Reserve (89 points). H. G. Cushion, Surlingham, near Norwich.

It was rather refreshing to find, for once in a way, a young plantation of apples which does not depend mainly on "Bramley's Seedling". In this orchard of 5 acres "Monarch" has been used with one tree in nine of "Worcester Pearmain" as a pollinator. The trees are half-standards on "crab", planted on the square at 24 feet.

They have been shaped moderately well, but the control of pests and diseases left something to be desired. Caterpillar damage was in evidence, scab could be found without difficulty, and a good deal of capsid (*lygus*) had got on to the trees from the undercrop of black currants, and was marking the fruit.

There is a very wide headland at one end of this plantation.

Bush Fruit.

Class 5.—Currants. Best managed plantation or plantations of fruit-bearing age. Not less than 2 acres must be entered. (10 entries.)

First (98 points). William Bracey, Martham, Great Yarmouth.

Of his 27 acres of black currants, eligible for the class, this competitor entered a 10-acre field of "Baldwin", carrying its third crop. The plantation presented a beautifully even appearance—no bad patches, no gaps. The rows, which run north and south, are broken by convenient cross-roads to facilitate picking and the carting on of manure.

Cultivation was very clean and thorough. Heavy annual dressings of pig manure are given, as is the general custom of the district; but it is the practice, on this place, to plough up to the bushes, over the manure, a little higher each winter, so that the rows are distinctly mounded up. It is considered that the bushes keep on sending out fresh roots into this mound of soil and manure, from points higher up the branches each year. It is not unreasonable to suppose that it was this practice which had enabled the bushes to withstand the drought so well, for the leaves were fresh and green, showing none of the yellowing seen to greater or less extent in several of the other plantations in the competition.

The bushes, planted 8 feet × 3 feet, were carrying a very heavy crop, the load on each bush being remarkably uniform throughout the field. The branches were cropping right down to the base.

Pruning had been very well done, and the plantation appeared to be quite free from pests and diseases. The only spraying done was the application of tar-oil wash in winter.

The plantation was awarded the Society's special medal for the entry receiving the highest number of points in the competition.

Second (91 points). Evan O. Benton, Avenue Farm, Hevingham, Norwich.

This entry consisted of two plantations of black currants, totalling 6 acres. One is of "Baldwin", planted in 1932, and the other of the same variety and the competitor's own stock of "French Black", both planted in 1929. The method of planting is to put the bushes 6 feet apart in rows spaced at 8 feet, and then to insert two cuttings close together midway between the bushes in the rows, making the final plant 8 feet × 3 feet. This plan seems to be quite satisfactory, the cuttings quickly producing bushes quite as large and productive as those planted as bushes.

The younger plantation was bearing its first crop, and a remarkably good one for the age. The older plantation was carrying a very heavy crop indeed. The variety of "French" type, now seen much less in the district than formerly, was here giving a fine account of itself, the long branches fruiting right down to the base.

There was a little aphis in evidence in spite of winter spraying with tar-oil wash, and there were a few gaps where reverted bushes had been taken out; a little reversion was showing in "Baldwin".

The same method of moulding up to the bushes had been adopted as remarked upon in reference to the first-prize entry, and again it appeared to have given protection from drought, good growth, and heavy cropping.

Reserve (90 points). Lord Fisher, Kilverstone Hall, Thetford.

The best of the black currants seen on this place were in splendid form, as happy and flourishing as any encountered in the competition, though not bearing such heavy crops as some. But the entire area of 38 acres had been entered, and it was necessary to take the whole into consideration when awarding points. There would have been some advantage in setting aside a smaller area of the best currants for the competition, so as not to include a 7-year-old block of bushes which were showing a good deal of capsid and some reversion, and from which more of the old wood might well have been cut.

"Boskoop" was here seen in grand form, not bearing so well as some other varieties, but doubtless at least as profitable on account of its early season. The heaviest crop was found on a special stock of "French Black". Other kinds grown are "Baldwin", "Victoria", and "Davison's Eight".

The soil here is very light, but excellent protection from drought is given by surface cultivation, the aim being to maintain a dust mulch by repeatedly moving the surface soil. A wide "sweep", which can be adjusted to fit the spaces between the rows, is kept continually at work and proves to be a most useful tool.

The plant is 8 feet × 4 feet, which is probably ideal for black currants where the bushes grow big.

The whole plantation had been winter washed with tar-oil, and parts had received also petroleum emulsion for capsid. A small area had been sprayed with lime-sulphur for big bud mite.

Reserve (90 points). S. C.-H. Boardman, How Hill Farm, Ludham, Great Yarmouth.

This plantation of 4¼ acres of black currants presents one or two features that are original. The bushes are planted 4 feet apart and the rows spaced as wide as 9 feet. This competitor believes in giving the bushes room to open out under the weight of crop, considering that the bending of the branches makes for fruitfulness in this crop just as it does with apples. In manuring also he departs from the almost universal custom of the district of giving pig manure annually, a compound fertiliser including nitrogen in organic form being substituted for the dung in alternate years. Certainly the treatment seems to answer at least as well, as the bushes here are very large and flourishing.

"Davison's Eight" does extremely well in this plantation. This variety was carrying a very heavy crop, and some of the bushes were meeting across the 9-foot space in their fourth year. "Victoria" also was cropping well. "Baldwin" and "Seabrook's Black" were not so heavy, and the latter was showing a certain amount of reversion.

Much care is taken here in the control of pests and diseases. Tar-oil wash had been used in winter, and petroleum emulsion to prevent risk of capsid and bud mite, whilst "Baldwin" is sprayed with Bordeaux mixture to prevent rust. Slight evidence of caterpillars could be seen and just a little of capsid.

Class 6.—Gooseberries. Best managed plantation or plantations of fruit-bearing age. Not less than 2 acres must be entered. (1 entry.)

Second (87 points). S. C.-H. Boardman, How Hill Farm, Ludham, Great Yarmouth.

A useful lot of "Careless" gooseberries planted between pears, but not outstanding enough to be awarded first prize. The leaves lacked the vivid green colouring of really flourishing bushes. They receive farmyard manure and potash every year, but a mulch of the former would probably have given better protection against drought. Spraying with lime-sulphur and arsenate of lead had been carried out and had given a good control of mildew and saw-fly, though there was still a little of the latter to be found. A good crop was being picked.

Class 7.—Raspberries, loganberries, or blackberries. Best managed plantation or plantations of fruit-bearing age. Not less than 2 acres must be entered. (4 entries.)

First (97 points). W. M. Gould, Mill Hill Gardens, South Walsham, Norwich.

A very good 2-acre plantation of "Lloyd George" raspberries, three and five years old. The rows are 8 feet apart, and the canes are planted in stools and kept to them. They were very even and free from gaps and standing up well without supporting wires,

Sand is said to be very close under the light top soil, only 9 inches down in places, but, with good surface cultivation, the ground holds plenty of moisture. Pig manure is applied annually, supplemented by potash, which has done much good on this land. The plantation had received the further assistance of a dressing of fish meal. Under this treatment the canes looked flourishing and were carrying a very heavy crop.

The plantation is nicely free from mosaic disease, which is so commonly found in "Lloyd George" nowadays. A little cane spot had been completely controlled by spraying with lime-sulphur. Dusting with derris had given a splendid control of raspberry bettle, but had not been applied quite early enough, with the result that a proportion of the earliest berries had been slightly disfigured by the beetles. The first dusting should be done before any of the white petals are showing.

Second (93 points). T. R. C. Blofeld, Hoveton Home Farm, Wroxham, Norwich.

An attractive plantation of "Red Cross" raspberries, planted 6 years and under. The rows are 5 feet apart, and the tall canes are neatly supported between twin wires. Just a few poor spots detract from the otherwise uniform appearance of the plantation. Pig manure only is used and suffices to give ample vigour. The plantation promised to yield a good crop, free from beetle damage.

Reserve (88 points). H. G. Cushion, Surlingham, near Norwich.

A very imposing piece of raspberries, the vigour being remarkable—probably rather too much for disease resistance. The variety is "Norfolk Giant", planted 4 years and under, the rows being rather extravagantly spaced at 8 feet. The canes are very neatly trained between twin wires. Pig manure is applied every year.

It was impossible not to take a serious view of a severe attack of cane spot, all the old canes being covered with the disease. Spraying with Bordeaux mixture, greatly assisted by the dry weather, had prevented any serious spread of the trouble to the young canes; but the result might easily have been different if wet weather had occurred.

Class 8.—Strawberries. Open to growers of not more than 4 acres. Best managed plantation, of which not less than 1 acre must be entered.

There were no entries in this class.

Class 9.—Strawberries. Open to growers of more than 4 acres. Best managed plantation, of which at least 4 acres must be shown.

First (97 points). F. G. F. Glenny, Surfleet, Spalding.

Out of 80 acres of strawberries grown on this place, 20 acres of various ages were entered for the competition.

The view is held here that "stock, cultivation, and the muck cart" are everything in strawberry-growing, and that, if these are given attention, there is no need to worry about aphis, tarsonemid mite, and all the other troubles which, in turn, have been advanced as the reason for the prevailing failure of strawberries. Whether or no this doctrine holds good in all places, it certainly works out successfully here. Over this large acreage one sees none of the poor spots and gaps that so commonly detract from the productiveness of strawberry plantations nowadays. Healthy, vigorous plants, broad, uniform rows, and heavy crops are the rule.

The maiden plants are set out at about 9 inches apart in rows 40 inches asunder, on land which has been given a moderate dressing of pig manure. In the following spring they are deblossomed, and afterwards gone over by experienced hands who pull out any plants that are poor, undersized, or in any way suspicious or abnormal. The gaps so formed are immediately filled by layering in runners from neighbouring healthy plants. A dressing of bone-meal is then given, for these maidens have to supply runners for sale in addition to building up strong crowns for future cropping. Each autumn a heavy dressing of pig manure is applied and scuffled in.

The land is light silt, and is given plenty of surface cultivation. Weeds in the rows are pulled out in advance of strawing, but some were still to be seen in one or two spots. Numerous varieties are grown, but those prevailing on the area set aside for the competition were "Royal Sovereign" and "Oberschlesien". Plenty of straw had been well laid down, and the plants dusted with sulphur to prevent mildew. There was all the promise of a heavy crop, though, in common with all strawberries in the very dry season, rain was badly needed to bring the promise to fulfilment.

Second (88 points). T. R. C. Blofeld, Hoveton Home Farm, Wroxham, Norfolk.

A remarkable 6-acre plantation, considering that it was bearing its sixth crop. At that age there were bound to be poor spots, but they were not unduly numerous.

The varieties grown are "Royal Sovereign" and "Paxton", planted 15 inches × 30 inches. The plantation is given pig manure every year with the addition of 2½ cwt. per acre of sulphate of potash.

Strawing was only fair. There was a little caterpillar damage to the leaves, and some aphis could be found. Quite a good crop was maturing.

Reserve (85 points). H. G. Cushion, Surlingham, near Norwich.

This entry consisted of 4 acres of Royal Sovereign", planted 4 years ago at 1 foot × 3 feet. The best plants were vigorous and productive, but the area presented a very patchy and uneven appearance. This was largely due to the plants having been "put in rough", without sufficient cleaning of the land, so that a good many replacements had to be made in after years. Strawing had been done moderately well.

Table of Points.

Class	No.	Exhibitor	Award	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	Total
1	2	A. R. Garner ...	1st	9	9	10	5	5	29	9	20	96
	4	Westwick Fruit Farm	2nd	10	10	10	5	4	20	10	15	84
	1	T. R. C. Blofeld ...	Res.	8	10	10	5	5	18	9	15	80
	3	Honing Fruit Fms.		8	9	10	5	3	24	6	14	79
2	5	J. W. Burrows ...	1st	9	9	10	5	4	28	10	20	95
	6	W. M. Gould ...	2nd	7	9	8	5	4	29	8	20	90
	7	Lt.-Col. G. E. Todd	Res.	10	10	10	2	5	24	10	18	89
3	8	Westwick Fruit Farm	2nd	10	10	10	5	5	25	9	10	84
4	11	W. D. Everington	1st	8	9	10	4	5	29	10	17	92
	9	S. C.-H. Boardman	2nd	10	10	10	3	5	28	9	16	91
	10	H. G. Cushion ...	Res.	10	8	10	5	5	24	7	20	89
5	16	W. Bracey ...	1st	15	10	19	19	10	10	10	5	98
	13	E. O. Benton ...	2nd	15	9	18	16	9	10	10	4	91
	18	The Lord Fisher ...	Res.	15	9	16	17	9	10	10	4	90
	15	S. C.-H. Boardman	Res.	14	9	16	18	9	10	9	5	90
	21	Westwick Fruit Farm		15	10	15	17	7	10	10	4	88
	19	B. Rogers ...		12	5	18	18	9	10	7	3	82
	20	Tyler Bros. ...		14	8	15	14	7	9	10	4	81
	14	T. R. C. Blofeld ...		15	7	14	15	7	10	9	4	81
	12	R. Ames		14	8	15	16	6	10	8	3	80
	17	W. D. Everington		15	9	13	13	8	10	9	3	80
6	22	S. C.-H. Boardman	2nd	13	8	16	19	8	10	9	4	87
7	25	W. M. Gould ...	1st	15	10	19	18	10	10	10	5	97
	23	T. R. C. Blofeld ...	2nd	15	10	17	19	9	10	9	4	93
	24	H. G. Cushion ...	Res.	15	10	18	12	10	10	8	5	88
	26	Westwick Fruit Farm		15	10	12	16	7	10	9	3	82
8		No entry.										
9	29	F. G. F. Glenny ...	1st	10	5	15	24	14	10	10	9	97
	27	T. R. C. Blofeld ...	2nd	10	4	12	22	12	10	10	8	88
	28	H. G. Cushion ...	Res.	10	4	10	24	14	10	8	5	85

GENERAL REMARKS.

There was some compensation for the disappointing number of entries to be found in the general high quality of the competing orchards and plantations. As can be seen from the table of points, given on p. 486, nothing really poor was put before the Judges. The best growers in the area covered by the competition evidently set themselves a high standard, and realise that good quality as well as full productiveness is necessary nowadays, not only for prize-winning, but also for financial success. In some previous competitions the judges had to report that the control of pests and diseases was inadequate, in some cases hardly attempted at all. On this occasion no such complaint can be made. On the contrary, we were impressed by the readiness shown by the competitors to adopt the latest suggestions of research workers in this respect. For instance, in nearly all the apple orchards inspected, even those of quite small growers, spraying with some nicotine wash at the right stage after petal-fall had been done for the control of apple saw-fly. Apparently this treatment had been very successful, though there is just a chance that it was a trifle too early to judge. Apple capsid, at one time such a menace to growers in the Wisbech area, has now been robbed of most of its terrors by the use of petroleum emulsion wash at the delayed dormant stage, and much cleaner apples are being grown. Dusting with derris for the control of raspberry beetle was also general, another instance of the adoption of the latest ideas. We were impressed by the success of this method, which seems to be preferable to the alternative plan of liquid spraying with derris wash at a later stage to kill the larvae. Both methods prevent grub-infested fruit, but the dusting, if begun early enough, avoids also any damage to the berries by the adult beetles. One other example of the adoption of new methods of pest control may be mentioned : the use of petroleum emulsion wash for the control of bud mite on black currants. This has the advantage over the more familiar lime-sulphur treatment that it causes no scorching of sulphur-shy varieties.

Although we record a general high standard of pest and disease control, there were just enough cases where inadequate methods had been employed or insufficient care taken in the work, to emphasise the supreme commercial importance of efficiency in this department. Going from one orchard to another, the impression is gained that almost any outlay that is necessary to secure a clean crop and healthy trees or bushes is justified financially.

Leaving pests and diseases and turning to manuring, evidence of the adoption of modern technique was found in the

use of potash fertilisers. In several of the competing plantations of top fruit a course of potash dressings had been given for several years, and in one case it was stated to have cured severe leaf scorch in both apples and raspberries. Potash is not quite the "patent medicine" for all the ailments of fruit trees that is sometimes suggested, but it can undoubtedly be put to good use on the light soils of this area.

Top Fruits.

The best apple orchards were found on heavy land, two of them in the Wisbech district. As there were so few entries, this fact may not have any particular significance. The light land of East Norfolk is, at present, devoted more to bush fruits, but the culture of apples is increasing, and there is evidence that dessert varieties in particular can be well grown. This is shown clearly on the county demonstration plot at Burlingham, where most of the commercial varieties, including "Cox's Orange Pippin", are doing well. It is worthy of note that the county has given its name to what is locally considered to be a promising new market variety of dessert apple called "Norfolk Royal". Few pears were seen, but, where they did occur, they were doing reasonably well.

With both apples and pears it appears that a good control of scab cannot be relied upon in the area if only one pre-blossom application of fungicide is given. Where spraying had been done twice before blooming very much better results were obtained. The best growers in all parts of the country are no longer content with what used to be called a commercial control of this disease; they are dissatisfied if they can find scabby fruit when they search for it. The inclusion of lead arsenate in the wash used before as well as after blooming is also desirable. This should prevent the serious gnawing of a large proportion of the fruit by caterpillars seen in several of the apple orchards.

Although only one entry of cherries was received, the crop is grown to a considerable extent in Norfolk. The trees do not approach the great size and luxuriance of those seen on the best cherry land in Kent, but they are productive and profitable. No plums were entered, and very few trees were seen in the course of the tour.

Bush Fruits and Strawberries.

As was to be expected, black currants proved to be the feature of the competition, for this is the crop for which East Norfolk is justly famed. The fact that it thrives so well on the light sandy loam of this area has quite exploded the old assumption that it was a crop for heavy land. The fact is that black

currants need plenty of moisture and a free root run. This they get in Norfolk. The sandy loam is often of great depth and resting on chalk. Moisture rises freely through it and is easily kept in the land by surface cultivation. The soil, therefore, does not readily dry out. In spite of the severe drought, one could always find moist soil by scraping the surface with the foot in these well-cultivated plantations. Some of the crops were certainly showing the effects of want of rain, but, where they had been given the most skilful treatment, they were standing up to the dry conditions very well indeed.

Black currant growing in Norfolk has been standardised more than is seen with most crops grown for market. The only alteration of note in recent years has been an almost universal changeover from varieties of the French to those of Baldwin type. Other kinds are grown, of course, including some of the new "Westwick" varieties, but "Baldwin" predominates. The rows are usually 8 feet apart, and the bushes from 3 feet to 4 feet in the rows. Heavy dressings of farmyard manure are given every winter, most of the growers keeping pigs to provide the supply. Although this dependence on pig manure only has stood the test of time, and enables the growers not uncommonly to produce crops of 3 tons per acre, and occasionally more, we are not entirely satisfied that quite as good results could not be obtained by the more moderate use of dung supplemented by suitable artificials. At Westwick Fruit Farm we saw a plantation in which four rows had received, in addition to a moderate dressing of farmyard manure, 2 cwt. per acre of calcium cyanamide in early spring for two years in succession. The bushes in those rows were obviously larger and carrying a heavier crop than the rest, whilst their deep green colour showed that they were standing the drought better. It seems possible that the bushes are able to obtain nitrogen from a chemical fertiliser earlier in the season than from farmyard manure, and that this helps them in a dry season. Calcium cyanamide is used with success also on the Burlingham demonstration plot in years when there is not sufficient dung available; and one of the best plantations we saw is dressed in alternate years with farmyard manure and a compound fertiliser containing nitrogen in organic form.

It may or may not be a significant fact that the winners of both prizes for plantations of black currants adopt the plan of moulding up the soil to the bushes much more than is usual in the district, as described in the notes on the prize-winning entries. These plantations had resisted the drought better than any others, and it seemed not unlikely that this could be attributed to the moulding-up method. On the other hand, since both plantations are in the same neighbourhood, there

may possibly have been some slight variation of soil or even an extra shower to account for the difference.

The East Norfolk growers of black currants are well organised and very keen and receptive of new ideas. Many of them market their currants under the National Mark, the crops being inspected by officials of the Ministry of Agriculture to decide which of them are up to the required standard.

Although there were only a few entries of raspberries, they were sufficient to show that this crop is very well grown in Norfolk. Next to black currants it appears to be the most popular bush fruit.

It is rather surprising that entries of gooseberries and strawberries were not forthcoming from the Wisbech district, where both crops are largely grown. The class for growers of small plantations of strawberries, which was without entries, could have been filled from that district.

Technical Advice.

Throughout the area covered by the competition, there is ample evidence that the advice and assistance of the county horticultural officials is eagerly sought and appreciated, and that their work has brought about great improvement in cultural methods in recent years. Pruning and spraying are two operations in which the influence of their work can be traced, particularly in the closely-planted orchards of the Wisbech district.

Judges { E. M. Bear.
J. Stoddart.

REPORT OF THE COUNCIL TO THE ANNUAL GENERAL MEETING OF GOVERNORS AND MEMBERS OF THE SOCIETY,

HELD AT THE

Royal Agricultural Hall, Islington, London, N.,
On WEDNESDAY, December 12, 1934, *at* 2.30 *p.m.*

Membership.

1. The Council have to report that the list of Governors and Members has undergone the following changes since the Annual General Meeting on December 6, 1933:—10 new Governors (including 1 transferred from the list of Members under Bye-law 9), and 398 new Members have joined the Society, and 1 Life Governor and 4 Members have been reinstated under Bye-law 14; whilst the deaths of 1 Honorary Member, 2 Life Governors, 9

Governors, 67 Life Members, and 188 Members have been reported. 1 Life Governor, 9 Life Members and 18 Members have been struck off the books under Bye-law 12, owing to absence of addresses; 1 Governor and 127 Members under Bye-law 13, for arrears of subscription; 9 Governors and 266 Annual Members have resigned.

2. In May last the Council suffered the loss of one of their number in the passing of the late Viscount Tredegar, who had been associated with the Society for nearly thirty years. Lord Tredegar became a Governor in 1923 and had been a Vice-President since 1928. He was President in 1927 when the Show was held at Newport, on which occasion he generously placed his park at the disposal of the Society and helped the Show in every way. His lordship was a keen agriculturist, interested in all matters concerning his estate and his tenants. He was a great sportsman, and the country remembers with gratitude the services he rendered during the war in the Royal Naval Reserve with his yacht which he placed at the disposal of his country. He kept up some of the best traditions of country life, carrying on a pack of foxhounds of his own, and following them himself as long as his eyesight permitted him to do so.

3. Amongst other Governors and Members whose loss by death the Society has to deplore are the Duke of Marlborough, K.G., the Duke of Wellington, K.G., the Marquis of Aberdeen, K.T., Viscount Churchill, G.C.V.O., Viscount Halifax, Lord Aberconway, Lord Ashton of Hyde, Lord Faringdon, Lord St. John of Bletso, Lord Swansea, D.S.O., M.V.O., Lady Armstrong, Lord Algernon Percy, Sir Louis B. Baron, Bart., Sir Cecil H. E. Chubb, Bart., Sir Leolin Forestier Walker, Bart., Sir Heath Harrison, Bart., Sir James I. Davidson, Mr. James Ainscough, Mr. Robert Bamford, Mr. H. R. Beeton, Mr. Phil Browne, Mr. Laurence Currie, Mr. W. J. Cutts, Mr. Robert Dickie, Prof. J. Cossar Ewart, M.A., F.R.S., Mr. Arthur E. Fair, Mr. Walter J. Fryer, Mr. F. C. Goodenough, Mr. William Graham, Mr. John A. Kay, Major J. A. Morrison, D.S.O., Mr. Leopold C. Paget, Mr. A. W. Perkin, Col. B. J. Petre, Mr. W. A. Prout, Mr. E. P. Rawnsley, Mr. C. E. Straker, Mr. J. M. Strickland, Capt. J. Bell White, C.B.E., R.N.R., and Mr. Robert Wright.

Honorary Members.

4. During the year the Council have elected as Honorary Members Dr. John Augustus Voelcker, who has been Consulting Chemist for the past fifty years, Mr. Charles Stewart Orwin, a former Editor of the Society's Journal and the first Editor of *The Farmer's Guide to Agricultural Research*, and Monsieur André Alexandre Villard, Administrator of the Agricultural Machinery Exhibition in Paris.

Numbers on Register.

5. These and other changes bring the total number of Governors and Members on the Register to 9,243, divided as follows :—

140	Life Governors ;
203	Annual Governors ;
1,673	Life Members ;
7,211	Annual Members ;
*16	Honorary Members.

9,243 Total number of Governors and Members, as against a total of 9,527 on the Register at the time of the last Annual Report.

Presidency.

6. H.R.H. The Duke of Kent having signified his willingness to act as President of the Society for 1935, the Council recommend that the name of His Royal Highness be submitted to the Annual General Meeting for election.

Changes in the Council.

7. To fill the vacancy in the list of Vice-Presidents caused by the death of Lord Tredegar, the Council have elected the Earl of Stradbroke. Col. Frank Garrett has relinquished the position as a "Nominated Member" of Council which he has held since 1924. Lord Strachie, who has represented Somerset since 1912, has resigned for reasons of health. The following Members have expressed their intention of not submitting themselves for re-election at the expiration of their present period of office :—Mr. Alfred Mansell, who has represented Shropshire since 1909 ; Sir John Cotterell, Bart., who has represented Herefordshire since 1924 ; and Sir Harold Mackintosh, a representative of the West Riding of Yorkshire since 1931.

In view of his long association with the Society's governing body, Mr. Alfred Mansell was on November 7 elected a Nominated Member of the Council.

Elections to the Council.

8. Members of Council retiring under the scheme of rotation at the forthcoming Annual Meeting are those representing the electoral districts of Group B, comprising Buckinghamshire, Devon, Durham, Essex, Herefordshire, Leicestershire, London, Nottinghamshire, Rutland, Shropshire, Suffolk, Surrey, Wiltshire, Yorkshire (West Riding), and South Wales. The Governors and Members registered in each of those districts have been notified, and the customary procedure is being followed for the election or re-election of representatives for the divisions concerned.

An election is also taking place in Somerset to fill a vacancy caused by the resignation of Lord Strachie.

* Includes two Honorary Members transferred from Ordinary Membership in 1934.

Council Meetings in 1935.

9. The Council have fixed the following dates for their meetings in 1935:—February 6, March 6, April 3, May 1, June 5, July 3 (in Newcastle showyard), July 31, November 6, December 11 (Smithfield Show week).

Accounts.

10. In compliance with the bye-laws, the Council beg formally to submit the balance-sheet with receipts and payments for the year 1933. These accounts were circulated to Governors and Members in June last, having been certified as correct by the Professional Accountants and Auditors.

Copies of these accounts, and also the Statement of Receipts and Expenditure of the Show held this year at Ipswich, will be available for reference at the meeting on December 12.

Ipswich Show.

11. East Anglia as a whole has every reason to be proud of the 93rd Show of the Society, held at Ipswich from the 3rd to the 7th July under the Presidency of the Earl of Stradbroke. It can truly be said that this was the most successful show since 1929. Not only was the invitation from Ipswich a most cordial one, but all connected with the organisation threw themselves wholeheartedly into the project. The sincerity of their invitation and promises was proved by really sound spade work to help forward the arrangements, both financial and otherwise.

12. About 80 acres in extent, the site on the London–Colchester–Ipswich road provided an almost ideal showground. It has to be recorded with great regret that Major Eustace Quilter, from whom the site was acquired, died before the holding of the Show to which he had so long looked forward.

13. Entries in both the Implement and Live Stock sections exceeded those of recent years. In particular, the East Anglian breeds—Suffolk horses, Red Poll cattle and Suffolk sheep—made a brave display.

14. Several new features were introduced at Ipswich. Single Bird Egg-Laying Trials were organised by Sir Guy Hambling with a committee of experts. The Milk Marketing Board had an official education and advisory exhibit, with trade stands allied to the milk and dairy industry in close proximity. Near the Main entrance a Bureau was erected where visitors from the Dominions and foreign countries could obtain from the attendant and interpreter in charge information about the Show with directions to enable them to tour the exhibition ground in the easiest and most convenient manner.

A Light Luncheon Bar was provided in the Members' Pavilion.

15. The Chief Constables of Ipswich and of East Suffolk shared the duties of policing the showground, and this was very well done.

16. In conjunction with the British Herdsmen's Club, the Eastern Counties Division of the Y.M.C.A. undertook the welfare work and organisation of sports for the stock attendants.

17. The Royal Horse Guards (The Blues) provided the Band as well as the Musical Ride and Trick Riding Display.

18. An outstanding feature of the Show was the exhibition in wagons of teams of heavy horses of the Shire, Suffolk and Percheron breeds. This was a most popular and attractive addition to the usual events in the Ring.

19. H.R.H. The Prince of Wales honoured the Show with a visit on Wednesday, July 4, coming by car from Frinton. He was received at the Royal Pavilion by the President, and afterwards inspected a Guard of Honour of the British Legion and the Old Comrades' Association. After luncheon, he accompanied the President on a tour of the showyard during which many of the outstanding exhibits were visited. On his departure, His Royal Highness very kindly consented to drive through the town of Ipswich.

20. Throughout the five days of the exhibition the weather was perfect, the heat of the sun being tempered by a cooling breeze from the North Sea. The total attendance at the Show is recorded as 107,001.

21. A special debt of gratitude is due to the Local Publicity and Press Advertising Committee for their continuous labours and the up-to-date methods they adopted to introduce the Show to the public both in England and on the Continent. Undoubtedly the success of the event was due in a very great measure to this publicity campaign.

Overseas Visitors.

22. Continuing the desire to stimulate the interest of Dominion and Foreign visitors to the Show, Sir Archibald Weigall and Colonel E. W. Stanyforth, the Reception Stewards, spared no pains to welcome such guests and afford them every information about the Show as a whole or any particular section they desired more carefully to inspect.

Several High Commissioners of Dominions in this country, many Breeders of Pedigree Stock from Australia, New Zealand, South Africa, etc., The King's Indian Orderly Officers, Continental Dairy Produce and Bacon Producers were present on one or more days. But perhaps the most picturesque visitors were the Sultan of Sokoto, the Emir of Gwandu and the Emir of Kano, three West African Chiefs, who attended the Show on Tuesday and witnessed the judging of the live stock.

Awards for "New Implements."

23. At Ipswich Show Silver Medals were awarded to the following for the new implements and appliances mentioned :—

Dunlop Rubber Co., Ltd.	Farm tractor wheels with pneumatic tyres.
Montgomery & Lecoche	Pig Weighing Machine.
Miller Wheels, Ltd.	Cultivator Unit.
W. N. Nicholson & Sons, Ltd. ...	Self-cleaning Harrow.
Automatic Gates Co.	Automatic gate and door opening device.
Hosier Open Air Pure Milker, Ltd.	Mechanical Milk Recorder.

On the recommendation of the Judges of Implements the tests of the tractor entered by Bristol Tractors, Ltd., and the drill of Messrs. Ransomes, Sims & Jefferies, Ltd., have been deferred until next year.

Dairy Cattle Judging by Young Farmers.

24. Teams representing England, Wales and Northern Ireland took part in the Thirteenth Annual International Dairy Cattle Judging Competition which was held in Ipswich showyard on July 4 under the auspices of the National Federation of Young Farmers' Clubs. The *Daily Mail* Gold Challenge Cup was on this occasion won by the team from Northern Ireland, the Welsh team being second. Silver medals were awarded to the members of the winning team and bronze medals to those in the team taking second place. Each competitor received a certificate from the Society.

The awards were presented by the Earl of Stradbroke as President of the Society.

Woodlands, Plantations and Nurseries.

25. Twenty-seven entries of Plantations and three of Woodland Estates were received for this year's competition which was restricted to Breconshire, Cardiganshire, Carmarthenshire, Glamorganshire, Pembrokeshire, Radnorshire and Monmouthshire. No estate nurseries were entered. Mr. Humphrey Peel, of Taliaris, Llandilo, Carmarthenshire, won the Royal English Forestry Society's Gold Medal for the best plantation, and in the class for the best-managed woodlands on an estate of not less than 1,000 acres the Silver Gilt Medal offered as First Prize was awarded to the Duke of Beaufort, G.C.V.O.

26. In 1935 the area of the competition will cover the counties of Northumberland, Durham, Westmorland and Cumberland.

Orchards and Fruit Plantations.

27. There were 29 entries in the Orchards and Fruit Plantations Competition which this year was confined to an area comprising the East Riding of Yorkshire and the Counties of Lincoln and Norfolk, including the Isle of Ely. Mr. William Bracey, of Martham, Great Yarmouth, was awarded the Society's Special Medal for the entry which received the highest number of points.

28. Next year there will be no competition for orchards and fruit plantations.

Awards to Farm Workers for Long Service.

29. During the present year the following have been awarded Medals and Certificates for long service :—

	Years' Service.
Thomas Charles Cooper, 2, Chathill, Tandridge, Oxted, Surrey	70
Frederick Huxley, Tilesford Farm, Pershore, Worcs. .	62
Frederick Charles Jones, London Road, Northiam, Sussex	55
Charles Copping, Pump Cottage, Sutton, Woodbridge	53½
George Carter, Clench Green, Northiam, Sussex	52
John Lockyer, Main Street, Northiam, Sussex	50
Edwin Mutton, Warkton, Kettering	49
Frederick Upson, Grange Farm, Kesgrave, Ipswich ..	49
Fred Hammond, High Street, Ixworth, Bury St. Edmunds	48
George Moore, Poplar Hall, Hastingwood, Harlow	48
Elizabeth James, Goteley Manor Farm, Northiam, Sussex	47
William Thomas Plowman, Benningham Grange, Occold, Eye	46
Ernest Butler, London Road, Northiam, Sussex	45
Thomas James, Goteley Manor Farm, Northiam, Sussex....	45
Harry Richards, 71, Beechwood Road, Caterham Valley, Surrey	42
Philip Henry Hodge, Chathill Park Farm, Tandridge, Oxted, Surrey	41

30. The period of service qualifying for a Medal is 40 years on the same or different holdings with one employer, or 40 years on the same holding with different employers. Farm workers (male or female)—excluding gardeners, grooms and gamekeepers—in any part of England or Wales, are eligible for the awards. Claims on behalf of farm workers must be made through County Agricultural Societies on special forms which may be obtained from the Secretary of the Royal Agricultural Society of England, at 16, Bedford Square, London, W.C.1.

Newcastle Show, 1935.

31. The 94th Annual Exhibition to be held on the Town Moor, Newcastle-upon-Tyne, from Tuesday, July 2, to Saturday, July 6, will be the sixth Royal Show to take place in the City. Arrangements are now proceeding ; the Local Committee have held several meetings and the Northumberland and Durham County Societies are witholding their Shows and affording every assistance.

32. Special consideration has been given by the Stock Prizes Committee to the breeds of North Country stock requiring a classification in the Schedule, and the two above-mentioned County Agricultural Societies are offering special prizes for exhibits belonging to members of their societies.

Prize-Sheet.

33. Offers of Champion and other prizes have been received from the following :—Shire Horse Society, Clydesdale Horse Society, Suffolk Horse Society, British Percheron Horse Society, Hunters' Improvement and National Light Horse Breeding Society, National Pony Society, Dales Pony Improvement Society, Fell Pony Society, Shetland Pony Stud Book Society, Shorthorn Society, Hereford Herd Book Society, Devon Cattle Breeders' Society, Sussex Herd Book Society, Sussex Cattle Breeders' Society of South Africa, Welsh Black Cattle Society, Longhorn Cattle Society, Aberdeen-Angus Cattle Society, English Aberdeen-Angus Cattle Association, Dun and Belted Galloway Cattle Breeders' Association, Galloway Cattle Society, Highland Cattle Society, Dairy Shorthorn Association, Lincolnshire Red Shorthorn Association, Red Poll Cattle Society, Blue Albion Cattle Society, British Friesian Cattle Society, Ayrshire Cattle Herd Book Society, English Guernsey Cattle Society, English Jersey Cattle Society, British Kerry Cattle Society, Dexter Cattle Society, British Goat Society, Oxford Down Sheep Breeders' Association, Shropshire Sheep Breeders' Association, Southdown Sheep Society, Hampshire Down Sheep Breeders' Association, Suffolk Sheep Society, Dorset Down Sheep Breeders' Association, Dorset Horn Sheep Breeders' Association, Wiltshire Horn Sheep Society, Ryeland Flock Book Society, Kerry Hill (Wales) Flock Book Society, Clun Forest Sheep Breeders' Association, Lincoln Longwool Sheep Breeders' Association, Leicester Sheep Breeders' Association, Society of Border Leicester Sheep Breeders, Wensleydale Longwool Sheep Breeders' Association, Kent or Romney Marsh Sheep Breeders' Association, Herdwick Sheep Breeders' Association, Swaledale Sheep Breeders' Association, Rough Fell Sheep Breeders' Association, Cheviot Sheep Society, Welsh Mountain Sheep Flock Book Society, Black Welsh Mountain Sheep Breeders' Association, National Pig Breeders' Association, Large Black Pig Society, Gloucestershire Old Spots Pig Society, Cumberland Pig Breeders' Association, Essex Pig Society, National Long White Lop-eared Pig Society, National Welsh Pig Society.

It has been decided again to provide Bacon Pig and Porker Classes and Prizes at the Newcastle Show. The pigs are to be slaughtered at the close of the Show.

Special Prizes are being offered in the Poultry section by the Croad Langshan Club, Sussex Poultry Club, Columbian Wyandotte Club, Buff Orpington Club, British Barnevelder Club, British Black Barnevelder Club, Welsummer Club, Rhode Island Red Club, Plymouth Rock Society.

Closing of Entries.

34. Intending exhibitors at Newcastle are reminded that the final date for receiving entries of Live Stock is May 10. Entries

for Produce close on MAY 20, and entries for Poultry, Eggs and Butter-making Competitions on MAY 31.

Applications for space in the Implement, etc., Department must be made not later than March 20.

Show at Bristol in 1936.

35. In connection with the Bristol Show in 1936 a site has been acquired at Ashton Park through the kindness of the Hon. Mrs. Smyth. Preliminary arrangements as to occupation of the site have been concluded, a large and influential committee has been formed under the Chairmanship of the Lord Mayor of Bristol and everything possible is being done locally to foster interest in the Bristol Meeting.

Other Shows.

36. The 1937 Show will most probably be held in the Midlands and the 1938 Show at Cardiff.

Deputation to Railway Clearing House.

37. A deputation composed of delegates from the Royal Agricultural Society and the National Breed Associations representing horses, cattle, sheep and pigs, waited upon the Railway Clearing House authorities in April last, to request reductions in rates for the conveyance of live stock to shows and pedigree stock sales.

38. As from the 1st June the Railway Companies increased the allowances of food conveyed free in the same vehicle as animals, but they expressed regret that they were unable to reduce the rates for the carriage of animals and cartage, or to abolish the terminal charges.

Argentine Show Judging.

39. At the request of the Rural Society of Argentina, the Council again agreed to appoint the Judge of Shorthorn Cattle at the Palermo Show in September last. This year the duty was undertaken by Mr. Isaac A. Smith, of Belfast, whose verdicts appear to have given great satisfaction.

Chemical Department.

40. The number of samples submitted by members of the Society for analysis was slightly in excess of that for 1933 (120 as against 110 in 1933).

41. Changes in the supply or prices of feeding-stuffs have been only slight, but, with fertilisers, Sulphate of Ammonia experienced, in August, a marked fall in price, viz., from £7 5*s.* per ton (the ruling figure since February) to £6 14*s.* 6*d.* per ton. Still later (October), Sulphate of Potash and Potash salts generally became cheaper also. During the year, however, no fresh fertilisers or feeding stuffs of importance came to the fore.

42. The chief matter that occupied the attention of the Chemical Committee was the recrudescence of the occurrence of Castor-oil bean in feeding cakes imported from abroad. In fact, so serious did the matter appear to the Council when it was referred to them, that, in view of the Trade practice of allowing the presence of a certain amount of Castor to "pass" in contracts, the Council determined to approach the Advisory Committee of the Ministry of Agriculture on the question as to whether such trade practice was in conformity with the Fertilisers and Feeding Stuffs Act, and to ask for insistence on the total exclusion of Castor from Feeding Stuffs. A Deputation from the Council, headed by the President, was accorded an interview by the Advisory Committee. Their report has now been received, and is considered satisfactory.

43. A further matter calling for the attention of the Chemical Committee has been the introduction of the term "weatings" as taking the place of the different terms hitherto used for millers' offals, and which opens up a question as to the requirements being in accordance with the Fertilisers and Feeding Stuffs Act.

Botanical Department.

44. The general similarity of the climatic conditions of 1934 to those of 1933 was reflected in the inquiries received in the Botanical Department. When classified into subjects the lists of the two years are found to be practically replicas of one another except that the number of inquiries in 1934 is smaller than in 1933. Thus, if one or two garden pests are omitted the lists of fungoid diseases for the two years are identical and they again show a noteworthy absence of inquiries about cereal diseases, potato blight and apple scab, which between them usually account for the majority of the inquiries in this section.

45. Grassland inquiries were for the most part connected with the effects of two seasons of severe drought on their floras. Leys which have been down for three to four years appear to have been the greatest sufferers and invasion by such plants as yarrow and ribwort was reported on several occasions.

46. The failure to secure satisfactory "plants" in some of the drier districts was responsible for a few more tests of the germinating capacity of seeds than usual. In every case, however, it was found that the conditions of the seed bed rather than the quality of the seeds was at fault.

Zoological Department.

47. The principal work of the Zoological Department has consisted in answering questions from Members concerning vegetable pests and the parasites of domestic animals, and advising as to their treatment. Various specimens, suspected of being injurious or

interesting in other ways, have been sent for identification and their nature explained.

Doubtful points in the life-history of certain pests have been under investigation, and during the past year the cabbage aphis has been the subject of special inquiry at Cambridge.

Veterinary Department.

48. As in previous years the Professors of the Royal Veterinary College have given help and advice to Members of the Royal Agricultural Society on the prevailing troublesome epidemics of farm stock. This year, owing to the abnormally dry summer, certain internal parasitic affections have been brought into prominence.

49. Many inquiries have been received upon the subject of Contagious Abortion, Tuberculosis, Jöhne's Disease and Mastitis. Several instances of suspected poisoning have been investigated, also an outbreak of actinomycosis in which a number of cattle were involved. In one instance, a pig which died suddenly after having received a dose of worm medicine (this being suspected by the owner as the cause of death) was found on post-mortem examination to have an acute enteritis from another cause and advice was given as to the treatment of the others. Advice was also sought in connection with the sudden death of some deer, poison being suspected but not proved.

50. Numerous specimens have been sent up for microscopical examination and report, and considerable correspondence has been carried out to the mutual benefit of the owner and his veterinary adviser.

Animal Diseases.

51. Though there has recently been a number of outbreaks, Foot and Mouth disease during the first nine months of the year has fortunately been less prevalent than in 1933, and there have been fewer outbreaks of Parasitic Mange ; but the returns as regards Anthrax, Swine Fever and Sheep Scab all show an increase.

52. Concerning the last-mentioned, the Society received, at the end of September, the following communication from the Chief Veterinary Officer of the Ministry of Agriculture :—

"Twelve months have elapsed since the discovery was made that sheep scab existed over a wide area of the North of England, and that flocks grazing the Pennine Range were extensively infected. It will be remembered that after considerable discussion between the various interested bodies, it was decided to deal with the situation by applying Parts 2 and 3 of the Sheep Scab Order of 1928 to those areas of open country where disease was

known to be prevalent, and later the Pennine Range (Movement of Sheep) Order was issued, namely, on February 23, 1934, which imposed special restrictions on the movement of sheep out of five areas in that part of the country. The August double-dippings, required in the three most northerly areas, have been completed and the position has again been reviewed.

"Forty-one outbreaks were brought to light during the August double-dippings, and they show that infection is particularly serious in the following two districts :—

(1) The open fells extending in a north-easterly direction from Ingleton in the West Riding, to Hawes in the North Riding, and

(2) The Westmorland fells lying immediately east and north-east of Appleby.

Disease has been found to exist in various other parts of the scheduled areas, and detailed consideration to the situation has been given with a view to deciding whether any modification of the restrictions is justifiable. As a result the Ministry has decided to release from restrictions certain parts of Westmorland, Lancashire and the West Riding, and to give power to the Westmorland Local Authority to exempt certain lowland flocks on fenced farms in the Appleby district from any further double-dipping this autumn. The released areas are not entirely free from infection, and the precaution is being taken of imposing restrictions by Notices (Form G) under Article 14 of the Sheep Scab Order, 1928, on those individual flocks which are known to have been in contact with diseased sheep.

"A further double-dipping of all flocks in the areas in which restrictions are being maintained has been arranged (after consultation with the Local Authorities concerned) to take place between 1st October and 15th November, 1934.

"The September double-dippings of flocks in the Peak District of Derbyshire and the West Riding moors immediately north thereof, *i.e.*, in the two southerly areas scheduled by the Pennine Range (Movement of Sheep) Order of 12th February, 1934, are now in progress. Twenty-five outbreaks have been discovered in these areas to date, and further double-dippings are arranged to take place during November, 1934. In view of the distribution of the outbreaks so far brought to light, the Ministry does not anticipate being able to grant any relief from restrictions in these two areas. Further double-dippings in these areas are being required in November, and when these have been completed the position will be again reviewed.

"The disease position in Cumberland is analogous to that of the Pennine Range, but the restrictions there in force are imposed

on individual flocks by the service of Forms G under Article 14 of the Sheep Scab Order of 1928.

"A review of the outbreaks which have occurred in Cumberland and the Pennine Range since 1st July, 1933, shows, without any doubt, that these northern counties are responsible for the great majority (over 80 per cent.) of the outbreaks of the disease in the country.

"Since 1st July, 1934, only one outbreak of Sheep Scab has been confirmed in any county in England outside the counties of Cumberland, Westmorland, Durham, Lancs, Derbyshire and the North and West Ridings of Yorkshire. This fact affords proof of the extent to which the disease has become localised as the result of the Ministry's and Local Dipping regulations.

"The campaign directed towards the eradication of sheep scab from the known infected areas will be energetically carried on, for the protection of those other parts of England which are free from disease. It is for this reason that a further double-dipping of all sheep in these infected areas during the present autumn has been decided on. The farmers in these districts have, during the present year, co-operated with the Ministry and Local Authorities, and the Ministry understands that there is a widespread feeling that the operations against this disease should be carried through to a successful conclusion. The prompt reporting of any suspicious cases by farmers, and clean gatherings with efficient dippings, are the most important factors in the campaign, and only with the willing co-operation of the farmers themselves can the successful completion of the work of eradication be achieved within a reasonable time."

Bovine Tuberculosis.

53. On the recommendation of the Veterinary Committee, the Council appointed representatives to confer with representatives of Cattle Breed Societies on the question of the eradication of Tuberculosis from Pedigree Herds.

54. The Conference took place on February 7, when it was resolved :—

(1) That this Conference is in favour of, and urges the institution of, a scheme for the eradication of bovine tuberculosis.

(2) That this Conference elect a Committee to consider the question of the eradication of tuberculosis from pedigree herds and the best means to secure this end.

55. The Cattle Tuberculosis Committee, which was composed of one delegate from each Cattle Breed Society with two Members of the R.A.S.E. Veterinary Committee, subsequently met and drew up a Scheme of Eradication. This has been circulated to the Breed Societies concerned.

The scheme, which is on a voluntary basis, proposes that each Society adopting it shall start an official list of "attested herds," *i.e.*, of herds which have passed two consecutive tests by the double intradermal method conducted at six months' intervals by a veterinary surgeon approved by the Society and have been proved to be free of tuberculosis, and a further list of those herds which are taking part in the scheme but have not yet attained the "attested" standard—to be called "probationary." Included in the scheme are rules as to the procedure to be followed during the process of eradication.

London Quarantine Station.

56. The Quarantine Station at the East India Dock, which for a period of six years was administered by the Society under an annual grant from the Empire Marketing Board, was at the end of March last taken over by the Ministry of Agriculture and Fisheries.

57. A record of the work and administration of the Station from its inception until its transfer to the Government has been prepared and will appear in the next volume of the *Journal.*

Importation of Corriedale Sheep.

58. In February the Council received an application from the Ministry of Agriculture under the Importation of Pedigree Animals Act for their approval of an importation of Corriedale Sheep from Australia. The Veterinary Committee inspected the flock book in which the sheep in question were registered, and the Council, on their recommendation, decided that they could offer no objection to the proposed importation.

Depression in the Cattle Industry.

59. On March 28 the Council, on the motion of Sir Arthur Hazlerigg, passed resolutions in the following terms and ordered that copies of them should be sent to the Prime Minister, the Right Hon. Stanley Baldwin, and the Minister of Agriculture :—

"That the Council of the Royal Agricultural Society of England begs to call the attention of the National Government to the continued severe depression in the cattle industry of the country, which affects a large majority of all farmers.

"The price of fat cattle is at present uneconomic and many good farmers have already been ruined and have had to give up their farms.

"The Council wish to impress upon the National Government the very critical position in regard to the approaching grazing season and to place on record their considered opinion that unless some immediate and drastic action to help the wholesale price of English fat cattle is now taken there will be widespread ruin in the grazing counties which will throw many agricultural workers out of employment."

Several possible courses appear to have been considered by the Government to relieve the grave situation of home beef producers, but the position was such that time had to be allowed for further examination of the various alternatives before the formation of a permanent policy. In the meantime, some steps had to be taken, and the Government decided to introduce a short-term measure—the Cattle Industry (Emergency Provisions) Act, 1934—which was passed through Parliament before the summer recess, and came into operation on September 1.

Warble Fly Campaign.

60. At their meeting held in November the Council agreed to give their support to the following resolution passed by the Warble Fly Committee set up by the Leathersellers' Company, on which the Society is represented :—

"In view of the concensus of opinion of all interested parties that it is urgently desirable that the universal dressing of cattle against the warble fly pest should be undertaken, and that suitable action should also be taken to deal with imported cattle, the Leathersellers' Company's Warble Fly Committee, representative of all parties concerned, urges that the Minister of Agriculture should without delay consider the administrative problems involved and the means to overcome them."

Research Committee.

61. The usual annual report of the Committee on their work in 1933 appeared in the last volume of the *Journal*. In the same volume also appeared a further report dealing with the experiments on the disposal of Sugar Beet By-Products, and an account of experiments at Woburn from 1893 to 1933 on Green Manuring and Sheep Folding on Light Land.

62. Investigations, which have been in progress for some time, have been energetically continued with the aid of grants from the Committee. Considerable work associated with the utilisation of Sugar Beet By-Products has been carried out at the Norfolk Agricultural Station, and is expected to be completed next year. It has been ascertained, among other things, that sugar beet tops are equivalent in food value to swedes. At the Animal Pathology Research Institute of the Royal Veterinary College satisfactory progress has been made in Bovine Mastitis research. The work has covered the bacteriology, diagnosis, prevalence in cows, and control. Lucerne inoculation is now well established. Last year 5,900 cultures (sufficient to inoculate 4,000 acres of lucerne) were issued. Tests are regularly made at Rothamsted to ensure that the cultures are maintained at a high standard. As the result of tests carried out with the electro-farming equipment at Rothamsted

farm buildings some very interesting particulars have been obtained. Electricity and oil are being compared as motive power. The accumulated data, covering over half a century at Woburn Experimental Farm, has been most carefully collated, checked and analysed. This heavy task will shortly be completed and the summaries should prove to be a very valuable guide to all farmers.

63. As mentioned in the last annual report, the separate publication of *The Farmer's Guide to Agricultural Research* has been discontinued. This now appears as part of the Society's annual *Journal*, with which it has been combined. A small number of reprints will, however, be available for sale at the nominal price of 1*s*. to the staff and students of Agricultural Colleges and Farm Institutes.

New Gold Medal.

64. Sir Thomas Middleton, as stated in the last report, was selected as the first recipient of the Society's new Gold Medal for distinguished service to Agriculture. The formal presentation of the Medal was made by the President at the meeting of the Council on May 30.

65. For 1934 the Gold Medal has been awarded by the Council to Sir Arnold Theiler, K.C.M.G., an outstanding figure in the world of veterinary pathology whose research work over a period of more than thirty years has been of tremendous benefit to mankind in the Union of South Africa and to the Empire as a whole.

Rothamsted Land Purchase Fund.

66. The Council contributed the sum of £500 to the fund raised by the Rothamsted Experimental Station for the purchase of the freehold of its land.

It is a matter for satisfaction that the total sum required was subscribed in time to prevent the sale of the land to outside parties.

Stenhouse Williams Memorial.

67. A sum of £20 has also been given to the fund to provide a memorial to the late Dr. Stenhouse Williams, who was the first Director of the National Institute for Research in Dairying. The Memorial took the form of a new Library at the Institute which was opened on October 13.

Highland Society's 150th Anniversary.

68. At the invitation of the Directors of the Highland and Agricultural Society of Scotland the President and Secretary attended the Dinner held in Edinburgh last February to celebrate the 150th anniversary of the formation of the Society. The President congratulated the Highland as the elder brother of the R.A.S.E. upon the historic occasion, and, in thanking the Directors for their kind hospitality, wished them all success in future years.

69. Several Members of the R.A.S.E. and closely associated with its work, viz., Sir Rowland Biffen, Sir John Russell and Professor J. A. Scott Watson, were made Honorary Life Members of the "Highland" Society at the anniversary celebrations.

Society's Representation on other Bodies.

70. Sir George Courthope has been appointed to represent the Society on the Council of the Sixth International Congress for Scientific Management to be held in London next July. Mr. William Burkitt has been nominated as the Society's representative to serve on the Technical Committee on Standards in the Dairying Industry set up by the British Standards Association. Mr. Thomas Neame has succeeded Lord Hastings (resigned) on the Council of the National Institute of Agricultural Botany.

Queen Victoria Gifts.

71. For the ensuing year the Trustees of the Queen Victoria Gifts Fund made a grant of £170 to be allocated as five gifts of £10 each to Male Candidates, three gifts of £20 each to Married Couples, six gifts of £10 each to Female Candidates: the distribution in each class to be left until after the election to pensions by the Royal Agricultural Benevolent Institution.

Since the fund was raised in 1897, £6,440 has been paid over to the Institution.

Medals for Cattle Pathology.

72. In the annual examination for the Society's prizes held at the Royal Veterinary College, the Silver Medal was won by Mr. T. F. Stokes, of Trefarclawdd, Oswestry, and the Bronze Medal by Mr. N. J. Scorgie, of Rosebank, Oldmeldrum, Aberdeen. The examination was conducted by the Professors of the College and comprised written and oral work in the diseases of cattle, sheep and swine.

National Diploma in Agriculture.

73. At the thirty-fifth annual examination held this year at the University of Leeds from April 12 to 19, the following 42 candidates were successful in gaining the National Diploma in Agriculture :—

Diploma with Honours.

William Alan Buckpitt, Seale Hayne Agricultural College.

Diploma.

Ian David Inglis Addison, East Anglian Institute of Agriculture.
Robert Finn Amos, South Eastern Agricultural College.
James Oliphant Andrew, South Eastern Agricultural College.
George Ernest Andrews, Midland Agricultural College.
Frank C. Berridge, University of Leeds.
Colin Bushell, University of Leeds.

Diploma—continued.

WILLIAM BRIAN CAMPBELL, University of Leeds.
WILLIAM DEMPSTER CARSON, West of Scotland Agricultural College.
JOHN ASTBURY COLLIER, Harper Adams Agricultural College.
JAMES LEWIS CONGDON, Seale Hayne Agricultural College.
JOHN STEPHEN DAKIN, Midland Agricultural College.
CECIL WILLIAM DAVIS, Harper Adams Agricultural College.
JOSEPH ALEXANDER DUNCAN, Harper Adams Agricultural College.
WILLIAM SHEERAN GLASS, Edinburgh and East of Scotland College of Agriculture.
RONALD LESLIE HARTLEY, Midland Agricultural College.
THOMAS HEANEY, Grove Hill, Castledawson, Co. Derry, N. Ireland.
ROBERT HOPE, Armstrong College, Newcastle-on-Tyne.
SAMUEL ISBISTER, University of Aberdeen and North of Scotland College of Agriculture.
RONALD DUNCAN JACKSON, South Eastern Agricultural College.
JOHN LEWIS, University College of Wales, Aberystwyth.
ANDREW ALLAN MCINTYRE, West of Scotland Agricultural College.
DONALD CAMERON MACLEAN, University of Glasgow and West of Scotland Agricultural College.
JEFFREY WILLIAM MILLER, Midland Agricultural College.
GEORGE MARTIN NELSTROP, University of Leeds.
ERNEST EDWARD JOHN PALLANT, South Eastern Agricultural College.
LEONARD PARFITT, Royal Agricultural College, Cirencester.
CHARLES EDWARD LIONEL POWELL, Harper Adams Agricultural College.
ROBERT FREDERICK REESON, Midland Agricultural College.
ROBERT PHILIP RICE, Harper Adams Agricultural College.
HAMILTON JOHN RIDLER-ROWE, Seale Hayne Agricultural College.
RAWSON ROBERTSHAW, University of Leeds.
NEIL ALEXANDER SELKIRK, University of Glasgow and West of Scotland Agricultural College.
HENRY RICHARD SMITH, Harper Adams Agricultural College.
JAMES HALL STEPHENSON, Midland Agricultural College.
DAVID BEYNON THOMAS, University College of Wales, Aberystwyth.
GEORGE ARKLESS TOULSON, Armstrong College, Newcastle-on-Tyne.
FRANCIS HUGO VILLIERS, University of Reading.
CHARLES RHODES WALKER, South Eastern Agricultural College.
FRANK IVOR WILLIAMS, West of Scotland Agricultural College.
ARCHIBALD WILLIAMSON, University of Glasgow and West of Scotland Agricultural College.
WILLIAM WILLIAMSON, Armstrong College, Newcastle-on-Tyne.

National Diploma in Dairying.

74. The thirty-ninth annual examination for the National Diploma in Dairying took place in September at the University and British Dairy Institute, Reading, for English and Welsh students, and at the Dairy School for Scotland, Auchincruive, Ayr, for Scottish students. Fifty-seven candidates were examined at the English centre, of whom thirty-two were awarded the Diploma; and forty presented themselves at the Scottish Centre, of whom twenty-one obtained the Diploma. No candidate at either centre this year reached the standard for Honours. The names of the successful candidates are below :—

English Centre.

Marjorie H. Ashton, The University and British Dairy Institute, Reading.
Frances Jardine Atkinson, The University and British Dairy Institute, Reading.
Ella Margaret Bartle, The University and British Dairy Institute, Reading.
Margaret Edith Bradshaw, The University and British Dairy Institute, Reading.
William Alan Buckpitt, The University and British Dairy Institute, Reading.
Dione Chapman, The University and British Dairy Institute, Reading.
Ruth Myrtle Clementi Christie, Studley College, Warwickshire.
Dorothy Kathleen Cockerill, Lancashire County Council Dairy School, Hutton, Preston.
Eunice Lovedy Coleman, The University and British Dairy Institute, Reading.
Edith Dinning, Lancashire County Council Dairy School, Hutton, Preston.
Jack Doyle, Midland Agricultural College, Sutton Bonington.
Michael Francis Essame, The University and British Dairy Institute, Reading.
Barbara Ruby Fairbridge, The University and British Dairy Institute, Reading.
Norah Gerrard, Lancashire County Council Dairy School.
Henry William Hicks, Seale Hayne Agricultural College.
George Henry Hughes, Seale Hayne Agricultural College.
Alan Whitehead Isherwood, The University and British Dairy Institute, Reading.
William George Lawrance, Seale Hayne Agricultural College.
John Lewis, University College of Wales, Aberystwyth.
Thomas Henry Matthews, Seale Hayne Agricultural College.
Edna Gertrude Mills, East Anglian Institute of Agriculture.
Mary Davies Morris, The University and British Dairy Institute, Reading.
Evelyn Grace Neeson, East Anglian Institute of Agriculture, Chelmsford.
Margaret Elizabeth Phillips, University College of Wales, Aberystwyth.
Charles Vosper Pike, The University and British Dairy Institute, Reading.
Hamilton John Ridler-Rowe, Seale Hayne Agricultural College.
William Albert Scriven, Seale Hayne Agricultural College.
Sara J. Shotton, Lancashire County Council Dairy School.
Frank Skinner, Seale Hayne Agricultural College.
Arthur Thomas Thwaites, Seale Hayne Agricultural College.
Grace Ugalde, The University and British Dairy Institute, Reading.
John William Ward, Midland Agricultural College.

Scottish Centre.

Beatrice Allardyce Birnie, 1, Springvalley Terrace, Edinburgh.
Agnes Adams Blackwood, Ailsaview, South Craig, Hollybush.
Helen S. M. Boyd, Dunnydeer, Insch, Aberdeenshire.
Charles Milfred Brayshaw, 47, West Cliffe Terrace, Harrogate.
William Dempster Carson, "Seafield," Port William.
Joseph Alexander Duncan, 320, Park Road North, Birkenhead.
Elizabeth R. W. Dunsmore, 16, Boreston Place, St. Ninians, Stirling.
Charles Paton Howard, 187, Queen Victoria Drive, Scotstounhill, Glasgow, W.4.

SCOTTISH CENTRE—*continued.*

ARTHUR FRANK JOHNSON, Castle House, Thirsk, Yorks.
HUGH N. MACARTHUR, Drumfad Farm, Helensburgh, Dumbartonshire.
FRANK ROBERT MELVIN, Elysfa, Stoneywood, Aberdeenshire.
JAMES PARLANE, 105, Middleton Street, Alexandria, Dumbartonshire.
WILLIAM PATERSON, East Cortiecram, Longside, Aberdeenshire.
BARBARA G. REDPATH, Springwells, Johnstone, Lockerbie.
RAWSON ROBERTSHAW, "The Farm," South Stainley, Harrogate.
GEORGE FRANK ROSS, Wellneuk, Kintore, Aberdeenshire.
DOROTHY MARY HUNTER STEELE, Ravelston Lea, Blackhall, Edinburgh.
W. ELIZABETH TEARE, "The Vaish," St. John's, Isle of Man.
FRANK NEWMAN TURNER, Gawber Hall, Barnsley, Yorks.
FRANK IVOR WILLIAMS, 309, Felixstowe Road, Ipswich.
JOHN M. WILSON, 10, Strathview Terrace, Balfron, Stirlingshire.

All the candidates at the Scottish Centre had been students at the Auchincruive Dairy School.

Congratulations to Lord Eltisley.

75. Early in the year the Council had the pleasure of offering its congratulations to Lord Eltisley on the honour conferred upon him. As Sir Douglas Newton, he has served on the Council as the representative of Huntingdonshire since 1922.

Trolley Buses.

76. The Society joined with other tenants in protesting against a proposal of the London Passenger Transport Board to run trolley vehicles through Bedford Square.

It is understood that the proposal is not now to be proceeded with.

The late King Albert of Belgium.

77. As representing the Society, the Earl of Stradbroke, President, attended the Memorial Service to the late King Albert of Belgium held in Westminster Abbey on February 22.

Photographs of Presidents.

78. A suggestion has been made that the Society should begin a collection of the photographs of its past Presidents as far as possible with the view of making up an album as an historical record.

Bye-law 154.

79. At the meeting of the Council on August 1, 1934, it was decided to alter Bye-law 154 providing for the re-election of Members of Council.

80. The Selection and General Purposes Committee considered that attendances by Members at Committees should count as a qualification just in the same manner as attendances at Council Meetings, in order to enable a Member to stand for re-election to the Council.

81. The Solicitors have been consulted and they advise that as the Bye-law at present exists the Council may not take into consideration attendance at Committee meetings in lieu of attendance at Council Meetings.

82. It is, therefore, necessary to amend Bye-law 154 and formal notice will be given to Members that the President of the Society at the Annual General Meeting on December 12 will move that Bye-law 154 be amended.

83. At present the Bye-law reads as follows :—

> No retiring Member of the Council who has not attended at least two Council Meetings in each year since his last election shall be eligible for re-election except under special circumstances to be decided by the Council at the meeting of the Council next preceding the issue of the Voting Papers.

84. It is proposed to alter this Bye-law to read as follows :—

> No retiring Member of the Council who has not attended at least two Council Meetings (*for which purpose attendance at two meetings of the same Committee shall be regarded as equivalent to attendance at one Council Meeting*) in each year since his last election shall be eligible for re-election except under special circumstances to be decided by the Council at the meeting of the Council next preceding the issue of the Voting Papers.

85. Particulars of the amendment with the requisite notice appeared on page 2 of this Report as sent out to the Governors and Members and the President will move the amendment of the Bye-law in accordance with the provisions of the Supplemental Charter and Bye-laws made thereunder at the General Meeting after the adoption of this Report.

By Order of the Council,

T. B. TURNER,
Secretary.

16, BEDFORD SQUARE,
LONDON, W.C.1.

ANNUAL REPORT FOR 1934

OF THE

PRINCIPAL OF THE ROYAL VETERINARY COLLEGE.

It is a matter for regret that, with the exception of foot-and-mouth disease, the position regarding the number of outbreaks of the scheduled contagious diseases of farm stock is less satisfactory than in 1933.

In the case of foot-and-mouth disease there has been a slight decrease, and much of the credit for this favourable position is due to the efficiency of the Veterinary Officers of the Ministry of Agriculture in dealing with each outbreak. In every case exhaustive enquiries were made in an endeavour to trace the source of the infection, but in no instance was there absolute proof. However, bearing in mind the many channels through which infection may be introduced into this country, the fact that in the twelve months under review only 79 outbreaks occurred is a matter upon which the Ministry of Agriculture can be congratulated.

Month	Gt. Britain	France	Germany	Holland	Belgium
January	1	1,074	113	579	329
February	—	652	80	214	168
March	—	613	73	105	102
April	—	287	110	59	81
May	1	135	48	51	40
June	—	146	56	132	36
July	—	98	27	459	19
August	3	92	40	1.391	15
September	4	21	19	3,120	20
October	24	15	14	2,880	9
November	28	3	16	48	1,173
December	18	28	32	230	20

Again there has been no outbreak of either rabies or glanders.

With regard to bovine tuberculosis there is now a prospect that within the next few years there will be made a serious organised start towards its eradication, the Government having voted £750,000 to be spent during the next four years with this object in view. The scheme of eradication has not been made public by the Ministry of Agriculture up to the time of writing.

It is a fact upon which we can congratulate ourselves that Local Authorities are becoming increasingly conscious of their duties under the Milk and Dairies Order. A rapidly-growing number of them are appointing either whole-time Veterinary Staffs—or a Chief Veterinary Officer with part-time practitioners working under his direction—to carry out clinical examination of the milking herds on an average three times a year, as well as other duties in regard to animal diseases. This clinical examination alone can never hope to eradicate bovine tuberculosis from the herds, but it can reduce its incidence to some extent, and can undoubtedly reduce very materially the incidence of the organisms in the milk supply. In relation to bovine tuberculosis routine inspection is of more value as a Public Health measure than as a Veterinary one, but it does also afford an invaluable opportunity for the Veterinary Officers to detect other diseases amongst the cattle, to point them out to the farmer, to impress on him their serious- ness, and to advise him how to prevent them, and how to treat them with the help of his local veterinary practitioner.

The following table shows the number of animals slaughtered under the Tuberculosis Order of 1925 :—

Year	Animals slaughtered
1930	15,263
1931	18,603
1932	19,027
1933	20,908
1934	—[1]

[1] Figures not yet available.

In the case of anthrax the figures are unfavourable compared to 1933, the rise being about 25 per cent :—

Year	Outbreaks	Number of Animals attacked
1930	392	446
1931	465	516
1932	344	418
1933	297	345
1934	395	453

Swine Fever also shows a rise approximately 25 per cent. over 1933 :—

Year	Number of outbreaks
1930	2,408
1931	2,026
1932	1,555
1933	1,414
1934	1,832

It is to be regretted that the position regarding sheep scab is still very unsatisfactory—a rise of over 40 per cent. compared with 1933. In the case of this disease the figures have risen

steadily from 1932. The outbreaks are, however, now largely localised and drastic action is being enforced by the Ministry aided by the Local Authorities.

The following table shows the number of officially confirmed outbreaks :—

Year	Number of outbreaks
1930	478
1931	347
1932	361
1933	518
1934	684

The increase of reported cases is due more, in all probability, to the more intensive and better organised search for the disease than to any actual increase in the incidence of the disease itself.

Parasitic mange shows a slight decrease compared with last year.

In my last year's report mention was made of the widespread losses due to two diseases not yet scheduled under the Diseases of Animals Acts, viz., contagious abortion and Johne's disease. From information obtained in all parts of the country it would appear that each of these diseases is each year the cause of as great a loss to the farming community as tuberculosis. It is not an uncommon experience to find herds which are infected with tuberculosis, Johne's disease and contagious abortion, and in such a case it is difficult, if not impossible, to say which is causing the greatest loss. As is no doubt generally known, there are various tests which can be applied for each and all of these diseases. Even, however, where the owner is willing to defray the expense of such tests it is a matter of great difficulty to advise what is the best course to adopt in attempting to eradicate three diseases from one herd within a reasonable time without causing the owner loss.

In the last report reference was made to two or three poultry diseases which are at the present time causing many fatalities. It is to be regretted that a disease hitherto very rare or unknown in this country, viz., fowl cholera, made its appearance in part of East Anglia during the past year. Its origin was traced to the importation of poultry and geese from the Continent. Energetic measures were taken by owners to destroy and burn the carcases of affected birds, and it is to be hoped that the complete eradication of the disease will not be long delayed. In view of the fact that more and more of those who may be termed general farmers are going in for poultry, I feel that no excuse is needed for the further mention of poultry diseases in this report. In this country poultry number over 60,000,000 head, and the annual value of the table-poultry and eggs greatly exceeds that of

wheat. A disease which is causing great loss at present is fowl paralysis. Scientists are not as yet certain as to its cause. Some cases are caused in all probability by an infection of coccidiosis, others by a distinct ailment. It is probably true that the most important factor in the prevalence of disease among poultry is loss of stamina of the breeding stock. This has been caused, in all probability, through the breeding and forcing of the pullets through several generations for high egg production and through stock birds having insufficient free run.

It is to be remembered that the Agricultural Research Council has working under its Animal Diseases Committee special *ad hoc* sub-Committees of scientists expert on each of the diseases mentioned in this report. It is to be hoped that adequate funds will be forthcoming to enable their recommendations, as to how these various serious diseases can best be overcome, to be carried out efficiently and expeditiously.

F. T. G. Hobday.

Royal Veterinary College,
Camden Town,
London, N.W.1.

ANNUAL REPORT FOR 1934 OF THE CONSULTING CHEMIST.

The Annual Report of a Scientific officer to his Society is not, as a rule, regarded as an important or specially interesting feature of that Society's Journal. It must necessarily traverse, year by year, much the same ground, and when, as in my own case, the number of successive reports has reached to fifty or thereabouts, the similarity between one and another is bound to be marked. Nevertheless, it has been a pleasure to me to note, more especially of late years, that, to judge from communications sent to me subsequently, these annual reports of the work of my department have not been without their value, and that considerable interest has been taken in them. For this I am grateful.

As before, the work done for Members of the Society does not take the form, or but rarely so, of the examination of routine samples. This, as a rule, is more readily procured through County Councils, agricultural colleges and local institutions, and the matters more generally referred to the Chemist of the R.A.S.E. concern special enquiries and difficulties which may have arisen in the course of farming practice.

The number of samples sent by Members in 1934 has been slightly higher than in 1933, 121 against 110 then. This, with 30 samples of Cider analysed in connection with the Society's Annual Show, brings the total to 151. The nature of these samples is set out in the list at the close of this report.

The year has not been marked by any feature materially affecting the supply, or even the cost to the farmer, of the ordinary fertilisers and feeding stuffs which he uses on his holding, nor has there been the introduction of any new material likely to bring about any decided change in farming practice. It can be said generally—as has, indeed, been the case of recent years—that the farmer is well supplied, and at no great expenditure, with all that he requires for fertilising his soil or feeding his stock.

Taking the case of fertilisers first: With the exception of Sulphate of Ammonia and other nitrogenous manures that, as regards price, are more or less dependent on it, changes of price have but rarely occurred, and the unit price of nitrogen generally has remained much as it was. The use of Sulphate of Ammonia has been declining slightly in England, Scotland and Ireland since 1929, that of Nitrate of Soda, however, increasing of late years. Beginning the year at £7 2*s*. 6*d*. per ton, the price of Sulphate of Ammonia went up to £7 5*s*. and remained steady until August, when it fell to £6 19*s*. 6*d*., and later to £6 17*s*. 6*d*. per ton. Cyanamide closely followed the line of Sulphate of Ammonia, the prices being practically the same for the like amount of Nitrogen guaranteed. Cyanamide appears to have been in demand largely for the killing of weeds as well as for its nitrogen content.

Nitro-chalk, in its convenient granular form, as prepared by Imperial Chemical Industries, has been in growing favour, and is undoubtedly a handy way of applying nitrogen and, at the same time, lime to soils deficient in the latter. Containing, as it does, 15 per cent. of nitrogen and being priced at £7 5*s*. per ton only, its extended use can be well understood.

Until August the prices of the various types of Potash salts remained steady, but then experienced a decided fall; Kainit, *e.g.*, going from £3 to £2 14*s*. 3*d*. per ton, Sulphate of Potash from £10 7*s*. to £7 18*s*. 6*d*. per ton, and Muriate of Potash from £9 2*s*. 6*d*. to £6 16*s*. per ton. In addition to the supplies from the German and Alsatian mines, Russia has come into the field as an exporter of Potash salts, the output from fresh sources in that country having already, in 1933, reached the large figure of 800,000 tons. The spread of sugar-beet growing has, no doubt, influenced the use of potash salts, while for Nitrate of Potash there would seem to have been an increased demand for fruit-growing purposes.

The marked fall in price of potash-containing salts might have caused me to review my annual Tables of Compensation Value—prepared for the Central Association of Agricultural Valuers—but, as these had been already issued before the prices had undergone the changes alluded to, this could not be done; and, anyhow, it remains to be seen how far the changes will be permanent.

The position with regard to Superphosphate supply and prices remained, until June, much as it was, but recently an advance has been made by the production of superphosphate in a dry, granulated condition. This has been found very acceptable and has led to an increased employment of superphosphate.

Basic Slag, likewise, has shown a 35 per cent. increase in use during the year, the material being all of British manufacture. Whereas, however, purchasers had begun to get accustomed to just two grades of Basic Slag—the one of high phosphate content and high solubility (80 per cent.), with one of lower quality and lower solubility (40 per cent. or less), an intermediate grade has now been introduced having a solubility ranging between 40 and 80 per cent. These changes in manufacture, and which are quite independent of any agricultural requirements, make it almost impossible to ascertain, by direct field experiments the relative values of different classes of Basic Slag—as the special Basic Slag Committee appointed by the Ministry of Agriculture (whose 12th Report has just been issued) have attempted to do. This must depend largely upon what kind of Basic Slag is available at the time.

Our old friend Peruvian Guano continues to be in demand for certain special crops and, possessing as it does the combination of organic and mineral fertilising matters in forms which artificial manures generally cannot entirely provide, it has its own particular sphere and is correspondingly appreciated.

Coming next to Feeding Stuffs, there have been even fewer changes than in the case of Fertilisers, as regards either supply or prices. Nor do I know of new feeding materials introduced to any marked extent. Of some formerly in regular use, *e.g.*, Palm Nut cake and meal, one now hears but little, while there would seem to have been a larger market for Maize and its products. Fish meal, in different forms, continues to have a steady sale, and is largely used in pig-feeding, the complaints previously urged as to its causing the bacon fat to have a "strong" taste being now seldom heard.

Staple foods such as Linseed cake and Cotton cake have held their place, and to them may be added Ground-nut (Earth-nut) cake and Soya cake and meal.

Barley meal—under the new regulations set out in the Fertilisers and Feeding Stuffs Act—has been very generally

satisfactory, and there has been little to complain of regarding it, even when sold as Grade II. The same may be said of Wheat offals, the sale of which has been vigorously pushed by the Millers' Mutual Association, under the name of "Weatings," a term which it has been attempted to regularise in substitution of the varied terms employed for wheat offals in different parts of the country. About this I wrote somewhat at length in my last Annual Report (Journal, R.A.S.E., 1933), and shall have something to say now in a subsequent section of this report. The question of the occurrence of Castor-bean in feeding-stuffs will also have separate treatment.

The price of Linseed cake (English-made) has ranged from £8 12*s*. 6*d*. per ton at the beginning of the year to £9 12*s*. 6*d*. (September), and, later, £9 2*s*. 6*d*. per ton. Foreign-made Linseed cakes have been procurable at prices from 30*s*. to £2 a ton less, and this has, no doubt, given an inducement to farmers to purchase them. But, as I have frequently pointed out, such economy not infrequently proves to be false, more especially with the class of Linseed cake known as "Expeller," or "screw-pressed" Linseed cake. For, whereas Linseed cake of British make has, almost without exception, proved to be pure and good, this cannot be said for foreign-made samples which are not infrequently found to be contaminated with castor-bean, and to have produced ill effects with stock. At the best, the purchase of these foreign-made Linseed cakes must be considered risky.

Cotton cakes have, almost without exception, proved good and pure. The prices for English-made cake have ranged from £4 (May) to £5 2*s*. 6*d*. (September). Decorticated Cotton cake and meal are but seldom heard of now.

Soya-bean cake and extracted Soya-bean meal are in considerable demand, the latter more particularly for milking cows. There has been, indeed, not above 5*s*. a ton difference in price between the cake and the extracted meal, the prices varying from £6 10*s*. to £7 12*s*. 6*d*. per ton throughout the year.

Ground-nut cake (decorticated) of foreign make suffers in a measure from the same difficulty as foreign Linseed cake, viz., the liability to contain Castor-bean. The price has been, all along, in the neighbourhood of £6 a ton.

Coconut cake has ruled at much the same figure, but, as remarked, little is heard now of Palm-nut meal, at one time extensively used.

Maize and Maize-products (germ meal and gluten feed) have been in large demand at prices varying from £5 10*s*. to £6 per ton, and have, as a rule, been fully satisfactory.

Rice meal and Rice bran have come but little to the fore.

Oats—including Sussex Ground Oats—have been quite good; the price of the latter has varied from £7 (January) to as much as £9 12*s*. 6*d*. (September) per ton.

Barley meal, after standing, until June, at £5 10*s*. to £5 12*s*. 6*d*. per ton, went up to £6 17*s*. 6*d*. in July, and as high as £8 15*s*. per ton in September.

Wheat offals experienced somewhat similar changes, the prices recorded to April being between £5 and £5 15*s*. per ton, but rising in September to £6 10*s*. and £7 per ton, falling, however, somewhat towards the close of the year.

Dried Brewers' Grains have cost from £4 10*s*. to £5 5*s*. per ton throughout.

Lastly, White Fish meal at £15 5*s*. and Meat meal at £11 10*s*. have continued with but little change in price.

The Regulations of the Fertilisers and Feeding Stuffs Act, 1926, as amended in 1932, came into force on August 1st, 1932, and have been found to work satisfactorily on the whole. Questions regarding the working of the Act continue to come up from time to time, and these are in due course considered by the Advisory Committee appointed by the Ministry of Agriculture. The advantage of having a body of this kind with power to consider and advise the Minister upon any needed alterations in the regulations affecting the working of the Act has been abundantly apparent, and has enabled provision to be made for changes in trade conditions, the introduction of improved methods of analysis, the settling, in the light of further experience, of formerly debatable points, and so on. Moreover, this has allowed, as will be seen later, the submission to representative bodies (alike of agriculturists and the several trade interests concerned) of questions on which opinions may vary, but which it is desirable to have decided by agreement. Such an instance presented itself in 1934 in the matter of the occurrence of castor-bean in feeding stuffs, one that engaged the long and careful consideration of the Advisory Committee and resulted in the issue, towards the close of October, 1934, of the Fourth Report of the Advisory Committee. Meetings of this Committee and of its Scientific Sub-Committee had been held earlier in the year for the preliminary consideration of the points involved. These had their origin in a request from the Council of the R.A.S.E. to attend as a Deputation in order to represent the grave troubles which, in the Council's opinion, arose from certain trade practices which sanctioned the occurrence in feeding stuffs of castor-bean, so long as the amount present did not exceed a certain figure.

A Deputation from the Council of the R.A.S.E., headed by the President, the Earl of Stradbroke, and comprising also Mr. Fred Smith (Chairman of the Chemical Committee), Mr. B. J.

Gates and Mr. J. Egerton Quested, was received by the Advisory Committee on March 27th. The Deputation pointed out primarily that the presence of a poisonous substance such as castor-bean constituted a grave danger to feeders of stock, that it occurred practically only in the case of cakes, &c., manufactured and imported from abroad, that its inclusion was purely the result of bad cultivation or want of care, castor-bean not being an impurity natural to the growing of linseed or earth-nut, the materials mainly concerned. The Deputation further pointed out that when castor-bean was present in these cakes, its distribution throughout a delivery was most uneven and variable, so that any attempt to state in figures the percentage present in any lot offered for sale was totally misleading. Finally, that the trade practice which had come into use within the last few years, and which ruled the contracts for imported feeding-cakes, &c., was distinctly at variance with the provisions of the Fertilisers and Feeding Stuffs Acts which (Section 7 (1)) forbade the sale " for use as food for cattle or poultry any article which contains any ingredient deleterious to cattle or poultry." The Deputation urged, in conclusion, that the only safeguard would be the exclusion, in any quantity whatever, of poisonous ingredients like castor-bean from feeding-stuffs offered for sale.

The representations of the Deputation were considered by the Advisory Committee on the same and the following day, and at a meeting at a later date (July 30th), a similar Deputation from the London Cattle Food Trade Association was received by the Advisory Committee and put forward their own views. The chief points which they urged were that castor-bean was a natural impurity of linseed and earth-nut, and that it was impossible to guard against its occurrence; that, when present to the limited amount allowed in their contracts (·005 per cent. of husk or bean), there was no evidence of its doing any harm; and, further, that the husk is probably in itself non-poisonous, and that therefore the determination of the presence of the bean, based on the occurrence of the husk, constituted no proof that a feeding-stuff would be likely to do harm.

The Advisory Committee, having heard the representations of both sides, proceeded to a careful consideration of the whole matter as put before them, and their decision is given in their Fourth Report, issued, as stated, in October, 1934, this having received the unanimous approval of the members.

In this report expression is given to the impracticability, in view of the admitted variation that may occur in different samples as regards the amount of castor-bean present, of " prescribing a limit below which a feeding stuff containing castor-seed can be regarded as non-deleterious."

Further, that whatever be the accepted basis in the trade, the Act specifically provides that "the implied warranty by the seller that the article is suitable to be used as a feeding-stuff, takes effect notwithstanding any contract or notice to the contrary," and that "the provisions of Section 7 of the Act are apparently not qualified by any reservation that could be construed as expressly permitting the sale of a feeding-stuff containing castor-seed, whatever be the quantity present."

The conclusions come to by the Advisory Committee are so fully in agreement with the representations put forward by the Deputation from the R.A.S.E., and with my own views, that it is not necessary for me to do more than express my entire concurrence with them, and to hope that they will result in a better state of the trade in these imported goods and in their entire freedom, in future, from poisonous ingredients. I can hardly refrain, however, from quoting a significant observation made by one of my colleagues when the Deputation from the Cattle Food Trade Association was urging that the finding of the husk of castor-bean did not necessarily imply that the poisonous seed itself was present. My friend suggested that it showed at least that the cake had been "in bad company!"

The Fourth Report of the Advisory Committee deals also with matters other than the foregoing, though the Castor question was by far the most prominent, the remaining subjects discussed having reference rather to points of procedure and explanation of terms. On these there was practically no difference of opinion and, as set out in the Report, they were generally agreed to.

The subject of Wheat offals, on which I shall have something more to say, was left over for later consideration.

What, however, was abundantly brought out, more especially in the castor-bean discussion, was the inadequacy of the provisions of the Act to secure the taking of an official sample in cases where suspicion had been aroused. This applies in particular to the case of feeding-stuffs imported from abroad and distributed from the port of arrival. Under the existing provisions a sample cannot be taken at a farm, nor even in the course of transit, but requires to be taken at some place where the seller has it in store. The sample must be that of the particular delivery which the seller is sending to the purchaser, and must be accompanied by the invoice relating to it. Now a great deal of what arrives by ship from abroad is never placed in store at all, but is divided up among the original purchasers of a cargo, according to terms agreed on before the arrival of the cargo. These purchasers act virtually as distributors, and have the several lots sent direct to their customers—who are often the farmers

themselves—without receiving the goods on their premises or storing them there. There was abundant evidence before the Committee to show that frequently such deliveries are held in barges or on the rail and are sent about from place to place until disposed of, no one actually storing them. Thus a farmer, as has actually happened, may have a delivery of cake sent to him under a guarantee as to its quality, and, on finding it to contain Castor or other injurious constituents, will not be able to get a formal sample of it taken because the cake had not been in the vendor's store. Even if it has been so stored, the bulk from which the particular delivery was taken may have since been removed and so be no longer available for the taking of a formal sample. Cases were brought to the Committee's notice where foreign cake, known to contain castor, had been sent about from place to place until disposed of, it being impossible, for the above or like reasons, to take a formal sample of it or to get anyone to acknowledge the possession of, or responsibility for, it.

The difficulty thus experienced in endeavouring to bring the Act into force threatens largely to destroy its usefulness and to make it, except perhaps for civil remedies, in great measure a dead letter—like its predecessor of 1906.

Some amendment of the Act in the direction of providing greater facilities for the taking of formal samples, and for fixing the responsibility for breaches of the Act on the right person, is clearly called for.

Wheat Offals.

In my last Annual Report I dealt somewhat fully with this subject, more particularly in view of the introduction of the term "weatings," one intended to take the place of the names used in different parts of the country—such as middlings, sharps, thirds, &c., for the various offals of wheat. I pointed out then that the term "weatings" is not one recognised by the Fertilisers and Feeding Stuffs Act, and that the guarantee given for the two grades offered is not in accordance with the requirements of the Act as regards wheat offals. Whereas the Act requires a statement to be given of the *actual amount* of fibre guaranteed, weatings are sold under the stipulation merely that they shall not contain *more than* 5·75 per cent. of fibre, and superfine weatings *not above* 4·5 per cent. Apart from the fact that the word "weatings" does not include such offals of wheat as bran and pollards, it is not, in my opinion, legitimate, when the Act requires the actual percentage of fibre to be stated, to say that *any* figure for fibre, so long as it does not exceed 5·75 or 4·5 per cent., as the case may be, is permissible. Clear evidence has been afforded to me of the evil attending such a

practice. Under the name of "Italian middlings" or some such term, there have been sent from abroad materials which are practically nothing other than low-grade flour, and which, on analysis, are found to contain only 2 per cent., or even less, of fibre. Whereas the Act would oblige the statement of the actual percentage of fibre present, the "weatings" definition would be unable to prevent the sale of such material as "weatings" or, what may very well occur, the mixing in this country of such foreign "flour" with other middlings, and the passing off of the mixture as "weatings." Where then does the boasted security to the British purchaser come in? No analyst, nor any trade "expert" either, would be able to say whether such a sample was one of home manufacture or not. The purchaser of wheat offals has the right conferred on him, by the Act, to know the class of offals he is buying, and this is largely secured to him by knowing the actual amount of fibre which the material —be it called "weatings" or something else—contains. It is not competent, in face of the Act's requirements, to insert any different statement by way of guarantee.

I note now a few matters which have come before me in the ordinary course of analysing samples of feeding stuffs or fertilisers sent me by members of the Society :—

A.—*Feeding Stuffs.*

1. *Ground-nut Cake containing excessive Sand ("Expeller" brand).*

I received from a member, for analysis, a sample of decorticated Ground-nut (earth-nut) cake, with the complaint that it had caused scouring with a number of his cows which had been fed on it. The price of the cake was £6 12*s.* 6*d.* per ton, a guarantee of its containing 8 per cent. of oil, albuminoids 54 per cent., and fibre 11 per cent., being given.

The cake was of the kind known as "Expeller" (or "screw-pressed"), this being a brand of cake manufactured abroad and respecting which I have not infrequently issued warnings, more particularly as regards the likelihood of its containing castor-bean. My analysis brought out that the cake had no less than 16·87 per cent. of sandy matter, and it was clearly not a fit food to give to cattle. I advised the returning of the cake and refusal to pay for it. The vendors behaved very well in the matter, allowing for the cake used, and also paying compensation for the harm done to the cows, so that the matter was amicably settled. Further enquiries made by me, however, failed to get the name of the actual importer, and it turned out —as often happens with these imported cakes—that the delivery was very irregular in character, some bags containing a large quantity of sand and others comparatively little.

2. *"Wheat Germ Middlings."*

A sample under this name was sent me by a member who had an offer made to him by a firm of millers. The material was stated to contain a considerable amount of "wheat germ" and also "vitamin B in its most concentrated form." The price was £8 a ton. My examination showed it to be no different to an ordinary good sample of middlings, such as was then selling at £5 15*s*. per ton.

3. *"Iodol."*

I have not infrequently called attention to the sale—at prices altogether disproportionate to their value—of certain specialised foods stated to contain iodine, vitamins and other "essential" ingredients. It was, therefore, with some satisfaction that I read of a case which came before the Sheriff of Wick (Scotland), in which a claim was made by the vendors for payment of £29, less discount, in respect of a purchase of 10 cwt. of a compound cattle-food called "Iodol." It was claimed that this food possessed ten times the value of linseed cake, and that, if fed to cattle, it would eliminate the cake ration! The Sheriff, after hearing the case, ruled that "Iodol" had no particular power of enabling (as had been claimed) cattle to assimilate ordinary food above the normal, and that the representations made concerning it were false He assessed the value of the material at £10 a ton, and gave judgment for the purchaser accordingly.

4. *Castor-bean in Linseed Cake.*

A fitting sequel to the discussions which had taken place in regard to the occurrence of castor in cakes of foreign make was supplied in the bringing, at the Uxbridge (Middlesex) County Court, in July last, of a claim by a farmer for the loss of three calves and injury to five cows through the feeding to them of linseed cake—of the "expeller" type—which was found by me to contain castor in considerable amount. The case was vigorously defended by representatives of the trade, who maintained that, as the "official analysis" gave the cargo as containing less than ·005 per cent. of castor, such cake was held in the trade to be "good." It was clearly shown, however, that, whatever the analysis may have been, the delivery was—as I have constantly urged must necessarily be the case when castor-bean is present as an impurity—so variable in nature as to make any quantitative analysis quite unreliable, and that the harm to stock had been caused by the occurrence of castor in that portion of the cargo, at least, which had found its way to the farmer in question. The Judge accordingly allowed the claim of £75, with costs.

5. *Apple Pomace (dried).*

An analysis of this material may be of interest. The figures were :—

Moisture	8.24
Oil (Petroleum extract)	2.97
*Albuminoids	7.06
Mucilage, Sugar and Digestible Fibre ..	58.02
Indigestible Woody Fibre	22.15
†Mineral Matter	1.56
	100.00
* containing Nitrogen	1.13
† including Sand and Silica	0.32

This would make the material appear to have a value similar to that of dried sugar-beet pulp, though, owing to the larger amount of indigestible fibre, it would probably be found less suitable for some classes of stock—pigs, for example.

B.—*Fertilisers.*

1. *Basic Slag (of variable nature).*

It does not necessarily follow—as I have often pointed out—that when a purchase is made under a contract, all deliveries supplied under that contract are equally good, but that it is necessary to check this by analysis.

In an instance which was referred to me, a member who believed he was receiving a certain quality of Basic Slag, sent me two samples representing different deliveries, though supposed to be similar material. The one of these, however, was found to contain 15·56 per cent. of phosphoric acid, the other 9·77 per cent. only.

2. "*Special Fertiliser*" (*dear*).

A member of the Society had purchased 6 tons of a manure offered as a "special fertiliser," at £6 per ton, carriage paid. The analysis of the sample sent to me showed: Nitrogen 1·60 per cent., Phosphoric Acid 3·55 per cent., and Potash 1·67 per cent. The "special fertiliser" appeared to be little more than dried sewage sludge to which potash salts had, probably, been added, and £4 per ton delivered would have been more than enough to pay for it. This was, indeed, what the purchaser, in spite of the vendor's protest, eventually paid.

3. *Flue Dust from a Flour Mill.*

Flue dust is ordinarily found to contain a fair amount of potash, though generally in a not readily available form. A sample sent me from the chimney of a flour mill was found, however, to have only a trace of potash. It was, further, distinctly acid and contained 12 per cent. of Sulphate of Soda, and so was useless as a fertiliser.

The following is a list of the different samples analysed during the twelve months to November 30, 1934 :—

Linseed Cake and Meal	2
Cotton Cake and Meal	2
Palm Kernel Cake	1
Ground-nut Cake	4
Compound Feeding Cake and Meal	13
Cereals, Offals, &c.	8
Brewers' Grains (wet)	1
Distillers' Grains (wet)	1
Dried Sugar-beet Pulp	1
Superphosphate	3
Mineral Phosphate	1
Basic Slag	6
Compound Manures	10
Raw and Steamed Bone	2
Sulphate of Ammonia	1
Shoddy, &c.	13
Potash Materials	3
Lime, Chalk, &c.	3
Milk	2
Soils	7
Waters	24
Miscellaneous	13
	121

I cannot close this Annual Report without recording my grateful acknowledgment of the honour done to me by the Council in making me an Honorary Life Member of the Society. This mark of esteem is one that I value most highly.

J. AUGUSTUS VOELCKER.

1, Tudor Street, E.C.4.

ANNUAL REPORT FOR 1934 OF THE BOTANIST.

With two seasons so closely resembling one another in their climatic conditions as 1933 and 1934, it is not surprising to find a close parallel in the type of enquiries received in the Botanical Department. When classified into subjects, the lists of the two years are almost replicas, with the result that the Annual Report of 1934 should be, in the main, very similar to that of 1933. But as the chief interest during the past year has been to compare the effects of two exceptional droughts on the crops and to watch for any differences, especially in the incidence of plant diseases, it differs somewhat in form. The enquiries coming in throughout the season provide a general indication of the state of affairs throughout the country, but the account which follows is based very largely on personal observations made for the most part

in the eastern counties. Such observations probably give a more accurate picture than the enquiries themselves, which again show a slight falling-off in numbers (1933, 196 ; 1934, 192), probably because the drought seemed to be a sufficient explanation of so many of the growers' troubles.

SEED TESTING.

The number of seed samples examined showed a small increase over that of the previous season, mainly because a faulty supply of seed seemed to be a possible explanation of failures to secure a satisfactory plant. Six of these samples were mixtures of grass seed, which with one exception had been sown about the normal time in the spring. The exceptional sample, which was sent in for examination in October, had been sown in July. As the germination tests showed that the seed was not faulty, the failures could only be attributed to unsuitable conditions, of which dryness of the seed-bed was obviously the most important. Grass seeds, especially the smaller sorts, germinate more slowly than most agricultural seeds, even under the ideal conditions provided during seed-testing. In the laboratory an adequate supply of moisture can be guaranteed, and there is no possibility of the seed-bed drying out. In such circumstances from 10 to 21 days have to be allowed for a germination test. An approach to such conditions can rarely have occurred in the drier parts of the country in 1934. The deficiency of rain throughout 1933 and during the winter of 1933–34 resulted in an unusually low water table, and the cultivation necessary for the preparation of the seed-bed dried out the surface soil far more than usual. Under such conditions—that is, with little or no moisture arising from below, a rainy period sufficiently prolonged to keep the seeds moist throughout the period required for germination was necessary to secure a "plant."

A second cause of complaint was the unusual prevalence of weeds in clover and lucerne. An examination of the seed samples disclosed no undue impurity ; in fact, the lucerne sample was weed-free. The only explanation that suggests itself is that some of the weeds, especially fat-hen, found the conditions more to their liking than did the plants resulting from the seed sown. Local observations did not suggest that such a state of affairs was general.

WEEDS.

The weeds sent in for identification were of little general interest. One, however, was an unusual plant to reach an agricultural laboratory. This was a specimen of a common water weed, *Elodea Canadensis*, which, in spite of repeated cutting, was growing in such quantity that it made fishing

difficult. The plant is not indigenous. It was introduced accidentally over half a century ago, and, though it fails to set seed here, within a few years it was to be found in most of the English rivers, and now it is common enough even in isolated ponds with no obvious outlets to streams. A few trials showed that the weed was easily killed under laboratory conditions. The merest traces of several well-known plant poisons, added to the water in which masses of the plant were growing, were effective. But one hesitated about recommending the trial of any of these substances on a large scale.

Three of the weed species were poisonous. The black nightshade (*Solanum nigrum*) was sent in on two occasions. This is one of the most widely distributed plants known and it is very abundant in some parts of this country, where, however, it is almost entirely confined to arable land. It seeds freely, and once the seedling stage is past the plants are difficult to kill, owing to the toughness of their roots and the ease with which severed plants root down again. The plant has the reputation of being poisonous. It is also said that the leaves can be used as a substitute for spinach and the fruits for currants. Possibly then the plant is toxic under some conditions of soil and climate and not under others, or again it may be that its world-wide distribution points to the existence of a number of different strains of it. It is advisable to assume that it is dangerous to livestock, but the fact that it is confined to arable land makes it unlikely that it will often prove a dangerous weed.

A specimen of henbane (*Hyoscyamus niger*) found in a chicken run was sent in for identification, with the appropriate comment that it "looked dangerous." It can hardly be described as a common plant, but it occurs casually, especially on waste ground and in situations where it was grown, possibly many years ago, as a drug plant. Its highly poisonous nature makes it advisable to destroy any plants which may be found before the seeds ripen. Hemlock (*Conium maculatum*) was the only other poisonous plant received during the year. The destruction of patches of it was under consideration, but the sender was doubtful about the identity of the plant.

GRASSLAND.

The number of enquiries in this section was smaller than in the previous season. Almost all of them were the direct consequence of the drought of 1933. Though, generally, the burnt-out pastures made a remarkable recovery when once again a supply of moisture was available to the roots, in many cases bare patches remained on which the grasses and clovers had been killed out. From the descriptions received it appeared that ploughing out and re-sowing was, on the whole, the best

method to adopt with badly-established young pastures, for patching with grass seed is often unsatisfactory. Later in the season the enquiries made it clear that such patches had often become colonised by arable-land weeds such as groundsel and shepherd's purse. The commonest trouble, though, was due to the spreading of plants such as yarrow and plantain, which had suffered less under the dry conditions than the grasses and clovers. One member, however, reported an actual improvement in an old pasture owing to the spread of wild white clover through burnt-out patches.

PLANT DISEASES.

Enquiries about the diseases of plants began in February, when specimens of potato tubers attacked by dry-rot (*Fusarium cæruleum*) were sent in for examination. Six similar specimen lots were received during the planting period, and another batch later which had been dug out of the soil where blanks had suggested that something was wrong with the seed tubers. Four of the samples were Sharpe's Express, and in all cases the seed had been obtained direct from Scotland. The symptoms of the disease are so characteristic that its presence should always be detected before planting. It can generally be identified when the clamps are opened, or if not then when the tubers are put out in sprouting trays. In the earliest stage small patches of the skin are sunken and wrinkled concentrically. The flesh becomes brown in colour and often cracked, the cavities so formed being filled with a bluish-grey mycelium. The affected tubers do not rot, but become dry, hard and shrivelled. Any showing such symptoms should be discarded before planting time. The occurrence of blanks, often the first intimation of the disease to the unobservant, will then be avoided.

A second common trouble in the potato crop was due to the fungus *Actinomyces scabies*, which is responsible for the disease vaguely known under the name of "scab." This begins as small brown spots on the skin of the tuber. These may spread and coalesce to form large patches. Minute cracks form in them which are healed over by the development of scab-like layers of cork. There is no extensive destruction of the tissues below the skin, and if the tubers are peeled little or no indication of the disease will be found. But potatoes covered with such scabs are difficult to market satisfactorily.

The disease seems to be particularly common in dry seasons, especially in crops growing on sharply-drained soils. Under garden conditions it can be controlled by placing lawn clippings

in the drills when planting, and it has been suggested that ploughing in a crop of mustard would have the same effect under field conditions.

The only other disease enquired about more than twice during the season was finger and toe. It is, of course, all too well known on swedes and turnips, but many do not recognize the symptoms of its presence on the roots of such Brassicae as Brussels sprouts and cauliflowers, which seem to be steadily finding a place as farm crops. The roots of plants taken from seed-beds, or purchased for planting out, should be examined, and any with pea-like nodules or abnormal thickenings on them should be rejected.

Apart from one or two diseases of garden plants and an outbreak of the disease known as "fire" in a commercial planting of tulips, the complete list of the species of fungi reported on is identical with that of 1933. But a comparison of the incidence of the commoner diseases during two exceptionally dry seasons is not without general interest, for it serves to a great extent to confirm the opinions formed in the previous year. As before, it was clear that the mildews as a group flourish under dry conditions. The various species attack a wide range of hosts, and outbreaks were noted on apple, red clover, sainfoin, peas, swedes, turnips and the cereals. The attacks appeared to be up to the average in intensity or distinctly above it. Swedes perhaps showed its effects most markedly, for fields could be distinguished from a distance by the silvery grey colour of the mildewed foliage. But it was impossible to estimate the extent to which the yield of the crops was depreciated, for their growth was undoubtedly checked considerably by the lack of moisture.

The rusts of the cereals were even less in evidence than in 1933. The commonest species, the yellow rust, was seen on a few occasions whilst looking over thousands of acres of wheat in the eastern counties. It was problematical, though, whether the worst of the attacks was severe enough to reduce the yield appreciably. Not a single specimen of the other two species, the brown and the black rust, was found throughout the season, although it was searched for at every opportunity. After harvest, however, when the drought had broken, yellow rust was common enough on "volunteer" plants in the stubbles.

But the remarkable failure of the cereal rusts to establish themselves was not in evidence with all of the numerous species in this group of parasites. In fact, a peculiarly virulent epidemic of a rust species growing on antirrhinums has to be recorded. The fungus was unknown in this country until 1933, when a few isolated outbreaks were noted. In 1934 it was difficult, at all events south of the Humber, to find a bed of these plants which was not heavily infected. Further, the intensity of the attack

seems to have been far greater than is usually the case in the United States and Canada, where the disease has been known for some years.

Of the other important cereal diseases the smuts, bunt, whiteheads (Ophiobolus) and the leaf spot of oats there is little to be said except that the impression left at the end of the season was that they were less prevalent than usual.

One somewhat unusual wheat disease due to *Claviceps purpurea*, the ergot fungus, was very prevalent in 1933, but the fact was overlooked until late in the season. The ergots, unless present in some abundance, are not easily seen in the field unless carefully looked for. They may or may not be found in the threshed grain. If they are of the normal size the threshing machine separates them out, and only fragments or small ergots find their way into the cleaned grain. It was only when examining exhibits of wheat at local shows that any idea of the commonness of this disease was obtained. Approximately one out of every five lots of wheat, probably particularly well dressed for show purposes, was contaminated with this fungus.

Although generally considered to be a somewhat rare fungus on wheat in this country, it is certainly fairly abundant, for during the period 1927–32 from 0·4 to 2·2 per cent. of the samples examined at the Official Seed-testing Station were found to be infected.

The ergots germinated under laboratory conditions, but the field conditions were apparently too dry for them. No infected plants were seen, and so far no ergots have been found either in the wheat at grain shows or in a few mills where a lookout has been kept for them.

Apple scab (*Venturia inaequalis*) was again absent from the list of specimens received in the Botanical Department. It was found early in the year, and for a time there seemed to be some probability of its spreading. But it failed to establish itself successfully, especially on the fruit, with the result that those growers who still think that clean crops can be produced without the trouble of spraying were once again justified in their belief.

Another signally unsuccessful fungus during 1934 was *Phytophthora infestans*—the cause of the well-known "blight" disease of the potato. It made little headway on the crop in 1933 and even less this season. It has been a practice for some years past to note down the position of potato clamps and visit them from time to time as the disease appears to make its first appearance on the volunteer plants arising from tubers thrown out when the clamps are opened. This gives a useful indication of the time spraying should commence. No symptoms of blight

were found this year until the middle of August, and it was then doubtful whether the browning of the tips of a few leaves was really due to the fungus. An examination in the laboratory settled the point, for the characteristic spore-bearing branches of *Phytophthora* were formed on these discoloured areas when the leaves had been kept in a moist atmosphere for two days. In the open the disease failed to spread and the haulm died a natural death some five weeks after the appearance of the fungus had been noted. For once then spraying of the crop was unnecessary.

These diseases, chosen for description on account of their agricultural importance, are but a sample of those kept under observation during the season. One cannot express the results very definitely, for a technique for gauging the losses they cause still has to be developed. But the impression left on one's mind is that in 1934 the crops were singularly healthy and that the losses due to diseases caused by fungi were exceptionally low. The general resemblance of the 1933 and 1934 results makes it reasonably certain that the dryness of the season was the chief cause of this freedom from serious outbreaks of disease. This in turn seems to explain the fact that higher yields were generally obtained than seemed to be probable in so difficult a season.

GENERAL ENQUIRIES.

An unusual request for information about the seed-rate which should be made use of when drilling Manitoba wheat and Smyrna barley was received early in the spring. Figures for the former were available, for the wheat has been tested fairly extensively in this country. For the latter no definite information was available, and the normal barley seed-rate was suggested. After harvest a report on, and samples of, the crops were sent to the department. The wheat was an excellent sample and better in appearance than that obtained for planting. The barley proved to be a mixture of types with grain of indifferent quality.

Information was wanted about the use of sodium chlorate for the eradication of patches of stinging nettles. In the literature of the subject dressings at the rate of 80–100 lb. per acre are said to be effective, but further trials are desirable.

The cropping after breaking up unsatisfactory leys was the subject of several enquiries. They involved some interesting problems of crop rotations, for fodder crops had to be substituted for grass. Marrow-stem kale sown at intervals was the cropping adopted by one member who anticipated having to cope with an abundance of weeds.

R. H. Biffen.

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ANNUAL REPORT FOR 1934 OF THE ZOOLOGIST.

Introduction.

To the Entomologist the most striking characteristic of the past season has been the remarkable absence of many of the pests which in ordinary years most obtrude themselves on the notice of gardeners and allotment holders. Aphis, so destructive in 1933, has been very little in evidence, except in the case of a few species attacking fruit. It must be many years since rose growers were so little troubled by this pest, and even the ubiquitous bean aphis failed to appear in many allotments, where its occurrence is generally taken as a matter of course.

So also with other common vegetable pests. The dry season may have resulted in light crops of carrot and onion, but carrot-fly and onion-fly attacks have in most districts been much below the normal. The absence of celery-fly has been even more noticeable, while the cabbage caterpillars—always very irregular in their incidence and numerous in some places, while nearly absent in others—have on the whole done much less damage than usual to the various species of *Brassica.*

In the department of fruit, the absence of common pests has been much less noticeable, but even here one has been struck by the clean appearance of the apples on neglected trees which usually bear a meagre crop of spotted fruit.

Another conspicuous absentee was the wasp. I remember no season when wasps were so scarce in the districts which came under my observation during the summer, though I do not know if the experience was universal. If it was, it is even possible that we may have reason to regret their scarcity, for they play no insignificant part in the destruction of certain pests, especially Diptera. The quite unusual number of crane-flies seen in the late summer, suggesting future trouble from "leatherjacket," may be partly due to the shortage of wasps.

The comparative scarcity of many of the more conspicuous pests by no means signifies that crops have suffered little from insect attack during 1934, but the greatest amount of harm has been done in a less obvious way. Some of the underground workers—leatherjackets, cut-worms, chafer grubs, cabbage root-fly—have been even more destructive than usual, and there has been much re-sowing on account of the minute pests which kill off seedlings before, in the absence of rain, they are able to establish themselves.

In the following pages the principal pests, as revealed by personal observation and the letters of correspondents, are reviewed under the heads of the various crops.

Cereals.

Injury to corn crops by fly attacks seems to have been below the average in 1934. I received no complaints of frit-fly in winter wheat, or of wheat bulb-fly in June. A few cases of frit-fly in oats were reported, but they were not serious, and this pest was more conspicuous through the work of the second brood, which attacks the ear.

Two rather unusual pests were found injuring wheat in East Anglia. One was a cut-worm—the caterpillar of the moth *Apamea secalis*, which did considerable damage in a restricted area in Norfolk during the early spring. The other was a "mud-beetle," *Helophorus nubilus*, the worst cases of attack being in wheat which followed sainfoin.

In some districts both wheat and oats showed an unusual number of "blind" ears due to thrips, but complaints of this pest were not general.

By far the most serious damage to corn crops was by wireworm, which seems to have been more than normally destructive in 1934.

Root and Vegetable Crops.

In 1933 Aphis and slugs were the most frequent subjects of complaint. The prolonged drought seems to have greatly reduced the slug population during 1934, and damage by this pest was comparatively slight. Most species of Aphis also were much less in evidence than usual, though here there were exceptions. Rose bushes were remarkably clean, and the most familiar of all vegetable Aphids—the black bean Aphis—was a rarity in some districts. An exception was the cabbage aphis, *Brevecoryne brassicæ*, of which some severe attacks were recorded. This pest has been the subject of much research at Cambridge during the past year, and it is inadvisable to anticipate the full report which the Ministry of Agriculture and Fisheries have in view when the research is complete, but one important point emerges which is of interest to vegetable gardeners and allotment holders. It concerns the manner in which the Aphis is carried over from crop to crop in successive years.

It has generally been considered—and stated in text-books—that weeds of the cabbage tribe bridged the gap between one cultivated crop and that of the following year. This appears to be a mistake, practically all the eggs being laid on the stalks and leaves of the food-plant. It follows, therefore, that the main danger to the next crop arises from the plants which are allowed to remain in the ground during the spring of the second year, either deliberately, for seed, or through carelessness in the clearing away and burning of the old stumps.

Last winter the Aphis was active on Brassicæ plants till the middle of January, but by February only the eggs were to be found, and these were mostly on the stalks of the attacked plants. The eggs began to hatch in April, and the young brood crawled up to the flowers, where they settled down and multiplied, but it was not till the end of May that winged forms appeared—forms, that is, capable of carrying the infestation to new crops.

It is thus clear that in gardens and allotments it is important to root out and destroy all old Brassica stumps in early spring. It is also clear, unfortunately, that all those in the neighbourhood of large areas of Brassicas grown for seed are unlikely to escape infection. These seed crops, however, can be rendered fairly harmless by spraying with nicotine and soft soap in April, before the winged forms of the aphis have made their appearance.

Among other pests of plants of the cabbage tribe the cabbage root-fly was conspicuous. It was reported from several parts of the country, and in some districts the attacks were stated to be the worst ever known.

In such a dry season it was to be expected that flea-beetles should be particularly destructive, and this proved to be the case, especially with those species that attack Brassicas. Seed beds in allotments suffered severely and re-sowing was often necessary.

As remarked above, damage by the familiar cabbage caterpillars was, as far as my observations went, much below the average.

Among other vegetables there is little of interest to record. Beans suffered comparatively little from Aphis, but there were bad attacks of *Sitona* weevils, and a case of destruction by the caterpillars of the Swift moth. Onions, celery and carrots were remarkably free from attacks by their respective flies, celery crops especially presenting an unwontedly clean and healthy appearance during the autumn.

Sugar Beet. A very disquieting circumstance this autumn is the discovery of eelworm disease in sugar beet. Roots from a farm in the fens were sent to Mr. F. R. Petherbridge, who found them to be suffering from this pest, which has not hitherto been recorded from beet. So far only one case of definite injury has been noticed, but Mr. Petherbridge found that soil from beet sugar works contained cysts of the eelworm, though of course the particular district they came from could not be traced. In the case in question, sugar beet had been grown continuously for many years on land which had previously grown potatoes. It seems as though the strain of *Heterodera Schachtii* which attacks potato plants were gradually obtaining a hold on beet.

In my Annual Report for 1932, I drew attention to the fact that many plants, and especially peas, are subject to this pest, and that it might be desirable for allotment holders to wash their seed potatoes so as to make sure that the eelworm was not introduced in the form of cysts which often occur in the small amount of soil adhering to the tubers.

It is possible, and greatly to be hoped, that the pest will make little headway in beet. Many years ago I recorded its occurrence in Swedes, but I have never come across a second case. It is obviously very important that sugar beet growers should be on the look out for this new pest with which the crop is threatened.

Fruit.

Most species of Aphis affecting fruit plants were much less numerous, even on unsprayed trees, than in 1933. There seem, however, to have been two exceptions. There were bad attacks of the "mealy aphis" (*Hyalopterus arundinis*) on plum trees, and the Woolly Aphis on apple trees has never been more abundant. Attempts to eradicate the latter pest by establishing it parasite, *Aphelinus mali*, among infested trees have met with very varied success, but in some cases complete control has been obtained.

Of the common orchard pests, Winter Moth Caterpillars made a late appearance and were seldom very destructive. Codlin Moth, however, was widely complained of, and more than the usual amount of damage to apples was done by the second brood. Derris dusts and sprays have been so successful in controlling Raspberry Beetle that the importance of this pest has greatly declined during the past few years. The applications of spray or powder are generally directed against the larvæ of the beetle and are given in June—one about the middle and one towards the end of the month. Last spring cases were reported of considerable harm being done by the beetles themselves to apple blossom before they laid their eggs in the flowers of the raspberries or loganberries below, and an earlier application of the insecticide seemed to be indicated.

Forest and Timber Pests.

A case of failure of young larch trees in June was referred to this department and entailed a good deal of investigation. A large number of the plants were dying at the top, and there were slight signs that insects had been at work on the dead twigs. None of the larch pests, however, was found to be present, and microscopic examination showed that the trouble had really begun in the early spring, though it was not till June that it became evident. There is little doubt that frost was the real cause of the failure.

There were a few enquiries about timber pests, including "death watch" and "powder post" beetles (*Lyctus*).

Animal Parasites.

Questions have been answered about Warble-fly and sheep parasitic worms, and various specimens of parasites have been sent for identification.

It is a well-known phenomenon that certain rooms in certain buildings are subject to a recurring infestation by hosts of flies, which in some years occur in such numbers as to amount to a veritable plague. They are generally mistaken for the common house-fly, but the swarms frequently occur at times of the year when that pest has not made its appearance in any considerable numbers, and the fly in question always turns out to be of quite a different species. A common example is the "cluster-fly," *Pollenia rudis*. In a case reported last April the species proved to be another house-fly-like species—*Musca corvina*. These flies come into houses apparently merely for shelter, and with no evil intent—not in search of food or in order to lay their eggs—and why, year after year, they select the same rooms for invasion is very mysterious. The common measures against house-flies are ineffectual, because their breeding habits are different, the cluster-fly, for instance, breeding in earthworms!

Miscellaneous Notes.

Death's Head Moths.

It was noted in last year's Report that the occurrence of the large caterpillar of the Death's Head Hawk Moth seemed to be less rare than formerly in potato crops. In 1934 it has been quite common in some districts, several specimens having been taken in Kent, Dorsetshire and Berkshire. Specimens are sent rather out of curiosity than out of concern for the potato crop, for so large and obvious a creature is hardly taken seriously as a pest, and hand-picking generally meets the case. It is our largest British caterpillar, and as its natural food is the night-shade family, it is not surprising that it should occasionally appear on our only cultivated *Solanum* plant.

Wasps.

This has been an unusual season as regards wasps. In the Cambridge district they were almost absent this summer, and I was struck by their rarity in all the places I visited, which included parts of Hampshire, Dorset and Devon. One observer reports that in his neighbourhood they appeared very late in the season, numerous workers being seen in the autumn, when it is usual to see only queen wasps seeking winter quarters.

Perhaps it is worth mentioning that I received in September for identification some specimens so small that it was thought that they must belong to a different species, but they proved to be only undersized examples of *Vespa vulgaris*. It is clear that weather conditions had not proved favourable to the wasp family as a whole, and that there was considerable dislocation in their domestic economy. It is perhaps not sufficiently recognised that, while these insects are objectionable in very obvious ways, their unseen actions are distinctly beneficial. All their larvæ are reared on insect food, and to feed them immense numbers of insects are captured and killed by the workers. Anyone who has examined the debris beneath a wasp's nest in an outhouse must have been struck by the number of discarded wings to be found there. They certainly play some part in reducing the number of insect pests. Two-winged flies (Diptera) seem to be preferred, and it seems possible that the absence of wasps in the Cambridge district, and the appearance of unusual numbers of crane-fly (*Tipula*) on the wing, are phenomena not entirely unconnected.

CECIL WARBURTON.

School of Agriculture,
Cambridge.

Royal Agricultural Society of England.

(*Established May 9th*, 1838, *as the* ENGLISH AGRICULTURAL SOCIETY, *and incorporated by Royal Charter on March 26th*, 1840.)

Patron.
HIS MOST GRACIOUS MAJESTY THE KING.

President for 1935.
H.R.H. THE DUKE OF KENT, K.G.

Year when first elected on Council.

Trustees.

1919 H.R.H. THE PRINCE OF WALES, K.G., *York House. S.W.*1.
1922 H.R.H. THE DUKE OF YORK, K.G., 145 *Piccadilly, W.*1.
1930 H.R.H. THE DUKE OF GLOUCESTER, K G., *Buckingham Palace, S W.*1.
1905 ADEANE, CHARLES, C.B., *Babraham Hall, Cambridge.*
1895 BEDFORD, Duke of, K.G., *Woburn Abbey, Bedfordshire.*
1893 CORNWALLIS, Lord, *Linton Park, Maidstone, Kent.*
1887 CRUTCHLEY, PERCY, *Sunninghill Lodge, Ascot, Berkshire.*
1904 DARESBURY, Lord, C.V.O., *Walton Hall, Warrington.*
1898 DEVONSHIRE, Duke of, K.G., *Chatsworth, Bakewell, Derbyshire.*
1910 HARLECH, Lord, C.B., *Brogyntyn, Oswestry, Shropshire.*
1909 HAZLERIGG, SIR ARTHUR, Bart., *Noseley Hall, Leicestershire.*
1891 STANYFORTH, Lt.-Col. E. W., C.B., *Kirk Hammerton Hall, York.*

Vice-Presidents.

1922 BROCKLEBANK, Rev. C. H., *Westwood Park, West Bergholt, Essex.*
1921 BURRELL, SIR MERRIK R., Bart., *Floodgates, West Grinstead, Horsham.*
1908 DERBY, Earl of, K.G., *Knowsley, Prescot, Lancashire.*
1924 DESBOROUGH, Lord, K.G., *Taplow Court, Maidenhead.*
1900 GREAVES, R. M., *Wern, Portmadoc, North Wales.*
1929 HAREWOOD, Earl of, K.G., *Harewood House, Leeds.*
1903 HARRISON, WILLIAM, *Albion Iron Works, Leigh, Lancashire.*
1922 MILDMAY OF FLETE, Lord, *Flete, Ermington S.O., Devon.*
1915 PORTLAND, Duke of, K.G., *Welbeck Abbey, Worksop, Notts.*
1914 POWIS, Earl of, *Powis Castle, Welshpool, Mont.*
1934 STRADBROKE, Earl of, K C.M.G , *Henham Hall, Wangford, Beccles.*
1907 YARBOROUGH, Earl of, K.G., *Brocklesby Park, Habrough, Lincolnshire*

Ordinary Members of the Council.

1922 ALEXANDER, HUBERT, *The Croft, Sully, near Cardiff* (*Glamorgan*).
1931 BARCLAY, E. E., *Brent Pelham Hall, Buntingford* (*Hertfordshire*).
1911 BEHRENS, Major CLIVE, *Swinton Grange, Malton* (*Yorks, N. Riding*).
1932 BELL, JOHN, *The Hall, Thirsk, Yorks* (*London*).
1930 BENYON, HENRY A., *Ufton Court, near Reading* (*Berkshire*).
1928 BOHANE, EDWARD, C.B.E., *Simmons Court House, Donnybrook, Co. Dublin* (*Ireland*).
1934 BRUFORD, ROBERT, *Nerrols, Taunton* (*Somerset*).
1918 BURKE, U. ROLAND, *Edensor House, Bakewell* (*Derbyshire*).
1923 BURKITT, WILLIAM, *Grange Hill, Bishop Auckland* (*Durham*).
1931 BURRELL, WALTER R., *Knepp Castle, Horsham* (*Sussex*).
1929 BUXTON, Capt. H. G., *Cokesford Farm, Tittleshall, King's Lynn* (*Norfolk*).
1928 CHRISTY, Capt. HUGH A., *Llangoed, Llyswen, Breconshire* (*South Wales*)
1921 COURTHOPE, Col. Sir G. L., Bart., M.C., M.P., *Whiligh* (*Sussex*).
1921 *DAMPIER SIR W. C. D., Sc.D., F.R.S., *Upwater Lodge, Cambridge.*
1927 DUGDALE, Major W. MARSHALL, D.S.O., *Llwyn, Llanfyllin, Mont.* (*North Wales*).
1929 ELGIN, Earl of, K.T., *Broomhall, Dunfermline* (*Scotland*).

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* Nominated Member of Council.

Ordinary Members of the Council (*continued*).

Year when first elected on Council.	
1922	ELTISLEY, Lord, K.B.E., *Croxton Park, St. Neots* (*Huntingdonshire*).
1913	EVENS, JOHN, *Burton, Lincoln* (*Lincolnshire*).
1926	EVERARD, W. LINDSAY, M.P., *Ratcliffe Hall, Leicester* (*Leicestershire*).
1933	EVERETT, Major NORMAN, *Rushmere, Ipswich* (*Suffolk*).
1921	FENWICK, E. GUY, *North Luffenham Hall, Stamford* (*Rutland*).
1928	FORSHAW, THOMAS, *The Stud, Carlton-on-Trent, Newark* (*Notts*).
1922	GATES, B. J., *Pembury, Tring* (*Buckinghamshire*).
1916	GILBEY, Sir WALTER, Bart., *Elsenham Hall, Elsenham* (*Essex*).
1931	GLOSSOP, C. W. H., M.P., *Bramwith Hall, near Doncaster* (*Yorks., W. Riding*).
1925	HALE, WINDHAM E., *Mowbreck Hall, Kirkham* (*Lancashire*).
1925	HALL, J. HERBERT, *Hill House, Mobberley, Knutsford* (*Cheshire*).
1930	HANSFORD, Major C. C., *Watts Barn, Codrington, Chipping Sodbury* (*Gloucestershire*).
1905	HARRIS, JOSEPH, *Brackenburgh Tower, Penrith,* (*Cumberland*).
1926	HASTINGS, Lord, *Melton Constable Park* (*Norfolk*).
1919	HOBBS, ROBERT, *Kelmscott, Lechlade, Glos.* (*Oxfordshire*)
1931	JERVOISE, Major F. H. T., *Herriard Park, Basingstoke* (*Hampshire*).
1923	JOHNSTONE, Capt. G. H., *Trewithen, Grampound Road* (*Cornwall*).
1932	KILPATRICK, JAMES, *Craigie Mains, Kilmarnock* (*Scotland*).
1909	*MANSELL, ALFRED, *College Hill, Shrewsbury* (*Shropshire*).
1928	MATTHEWS, R. BORLASE, *Greater Felcourt, East Grinstead* (*Surrey*).
1927	NEAME, THOMAS, *The Offices, Macknade, Faversham* (*Kent*).
1922	NEILSON, R. B., *Holmwood, Sandiway, Northwich* (*Cheshire*).
1932	*NICHOLSON, A. C., *Trent Ironworks, Newark, Notts.*
1930	QUESTED, J. EGERTON, *The Firs, Cheriton, Folkestone* (*Kent*).
1928	RADNOR, Earl of, *Longford Castle, Salisbury* (*Wiltshire*).
1924	*RANSOME, EDWARD C., *Highwood, Ipswich.*
1927	*RUSSELL, Sir JOHN, D.Sc., F.R.S., *Rothamsted Experimental Station, Harpenden, Herts.*
1932	RYMAN, W. W., *The Manor Farm, Wall, Lichfield* (*Staffordshire*).
1923	SAMPLE, C. H., 26 *St. Mary's Place, Newcastle-on-Tyne* (*Northumberland*).
1932	SCOTT, Capt. J. B., *Rotherfield Park, Alton* (*Hampshire*).
1932	SHAFTESBURY, Earl of, K.P., G.C.V.O., *St. Giles's House, via Salisbury* (*Dorset*).
1931	SHELLEY, Sir JOHN F., Bart., *Shobrooke Park, Crediton* (*Devonshire*).
1930	SMITH, EUSTACE ABEL, *Longhills, Lincoln* (*Lincolnshire*).
1907	SMITH, FRED, *Deben Haugh, Woodbridge* (*Suffolk*).
1934	SMITH, WILLIAM, *The Leen, Pembridge, Leominster* (*Herefordshire*).
1929	STANLEY, Lord, M.C., M.P., *Knowsley, Prescot* (*Lancashire*).
1933	STEDMAN L. FOSTER, *Machen House, Lower Machen, near Newport,* (*Monmouthshire*).
1929	STRAFFORD, Earl of, *Wrotham Park, Barnet* (*Middlesex*).
1923	TANNER, E. CRAIG, *Eyton-on-Severn, Wroxeter* (*Shropshire*).
1920	THORNTON, F. H., *Kingsthorpe Hall, Northampton* (*Northants*).
1924	WAKEFIELD, JACOB, *Sedgwick House, Kendal* (*Westmorland*).
1933	WALKER, Sir IAN, Bart., *Osmaston Manor, Derby* (*Derbyshire*).
1933	WALKER, JOHN, *Knightwick Manor, Worcester* (*Worcestershire*).
1926	WEBB, FRANK, *Billington Estate Office, Leighton Buzzard* (*Bedfordshire*).
1929	WEBB, S. OWEN, *Streetly Hall, West Wickham* (*Cambridgeshire*).
1925	WEIGALL, Lt.-Col. Sir ARCHIBALD G., K.C.M.G., *Englemere, Ascot* (*London*).
1931	WHEATLEY, Lt.-Col. C. J. H., *Berkswell Hall, Coventry* (*Warwickshire*).
1918	WICKHAM-BOYNTON, T. L., *Burton Agnes Hall, Driffield* (*Yorks., E. Riding*).

* Nominated Member of Council.

STANDING COMMITTEES.

*** Under Bye-Law 73, the PRESIDENT is a Member *ex officio* of all Committees, and the TRUSTEES and VICE-PRESIDENTS are Members *ex officio* of all Standing Committees except the Committee of Selection and General Purposes.

The Honorary Director is a Member ex officio of all Committees.

Finance Committee.

ADEANE, C. (*Chairman*)
DEVONSHIRE, Duke of
CORNWALLIS, Lord
DARESBURY, Lord
BURRELL, Sir MERRIK
COURTHOPE, Sir G. L.
HAZLERIGG, Sir A.
BURKE, U. ROLAND
CRUTCHLEY, PERCY
GREAVES, R. M.
HALL, J. H.
HARRISON, W.
MANSELL, ALFRED
SMITH, E. A.
WHEATLEY, Col.

Journal and Education Committee.

CORNWALLIS, Lord (*Chairman*)
ELGIN, Earl of
RADNOR, Earl of
MILDMAY OF FLETE, Lord
BURRELL, Sir MERRIK
DAMPIER, Sir W. C. D.
HAZLERIGG, Sir A.
RUSSELL, Sir JOHN
ADEANE, C.
BROCKLEBANK, Rev. C. H.
BURKITT, W.
BURRELL, WALTER R.
DUGDALE, Major
MANSELL, ALFRED
NEAME, T.

Chemical Committee.

SMITH, FRED (*Chairman*)
SHAFTESBURY, Earl of
HARLECH, Lord
DAMPIER, Sir W. C. D.
RUSSELL, Sir JOHN
EVERETT, Major N.
GATES, B. J.
GREAVES, R. M.
HALE, W. E.
QUESTED, J. E.
SAMPLE, C. H.

Botanical and Zoological (Forestry and Orchards) Committee.

HASTINGS, Lord (*Chairman*)
SHAFTESBURY, Earl of
CORNWALLIS, Lord
COURTHOPE, Sir G. L.
HAZLERIGG, Sir A.
BENYON, H. A.
BURRELL, WALTER R.
CHRISTY, Capt. H. A.
DALLIMORE, W.
DUGDALE, Major
JERVOISE, Major
LEATHER, Col. G. F. T.
LE SUEUR, A. D. C.
NEAME, T.
WARDE-ALDAM, Col. W. S. A.
WEETMAN, Col. C. C.

Veterinary Committee.

BURRELL, Sir MERRIK (*Chairman*)
RADNOR, Earl of
HASTINGS, Lord
MILDMAY OF FLETE, Lord
GILBEY, Sir WALTER
HOBDAY, Sir F. T. G.
SHELLEY, Sir J. F.
WALKER, Sir IAN
WEIGALL, Sir A. G.
BARCLAY, E. E.
BELL, JOHN
BURKE, U. ROLAND
BURKITT, W.
BURRELL, WALTER R.
BUXTON, Capt. H. G.
CRUTCHLEY, PERCY
DUGDALE, Major
FENWICK, E. GUY
GATES, B. J.
GLOSSOP, C. W. H.
HARRIS, JOSEPH
JOHNSTONE, Capt.
MANSELL, ALFRED
QUESTED, J. E.
SMITH, FRED
STANYFORTH, Lt.-Col.
STEDMAN, L. F.
TANNER, E. C.
THORNTON, F. H.
WALKER, JOHN
WHEATLEY, Col.

Committee of Selection and General Purposes.

DARESBURY, Lord (*Chairman*)
THE PRESIDENT
HARLECH, Lord
MILDMAY OF FLETE, Lord
COURTHOPE, Sir G. L.
BROCKLEBANK, Rev. C. H.
CRUTCHLEY, PERCY

And the Chairman of each of the Standing Committees.

Research Committee.

DEVONSHIRE, Duke of (*Chairman*)
RADNOR, Earl of
CORNWALLIS, Lord
HASTINGS, Lord
BURRELL, Sir MERRIK
DAMPIER, Sir W. C. D.
RUSSELL, Sir JOHN
WEIGALL, Sir A. G.
ADEANE, C.
BURKITT, W.
BURRELL, WALTER R.
BUXTON, Capt. H. G.
DUGDALE, Major
MATTHEWS, R. B.
NEAME, T.
SCOTT, Capt. J. B.
SMITH, FRED
THORNTON, F. H.
WIGAN, Capt. D. G.

Stock Prizes Committee.

EVENS, JOHN (*Chairman*)
DARESBURY, Lord
BURRELL, Sir MERRIK
SHELLEY, Sir J. F.
WALKER, Sir IAN.
WEIGALL, Sir A. G.
BARCLAY, E. E.
BEHRENS, Major CLIVE
BELL, JOHN
BURKE, U. ROLAND
BURKITT, W.
BUXTON, Capt. H. G.
CRUTCHLEY, PERCY
EVERARD, W. L.
EVERETT, MAJOR N.
FENWICK, E. GUY
FORSHAW, T.
GLOSSOP, C. W. H.
GREAVES, R. M.
HOBBS, ROBERT
KILPATRICK, JAMES
MANSELL, ALFRED
NEILSON, R. B.
QUESTED, J. E.
SMITH, FRED
STEDMAN, L. F.
TANNER, E. C.
WALKER, JOHN
WEBB, FRANK
WEBB, S. OWEN
WICKHAM-BOYNTON, T. L.
The Stewards of Live Stock

Judges Selection Committee.—*Same as Stock Prizes Committee.*

Implement Committee.

STANYFORTH, Lt.-Col. E. W. (*Chairman*)
COURTHOPE, Sir G. L.
DAMPIER, Sir W. C. D.
BURKE, U. ROLAND
BURKITT, W.
BUXTON, Capt. H. G.
CRUTCHLEY, PERCY
EVENS, JOHN
EVERETT, Major N.
HARRISON, W.
MATTHEWS, R. B.
NICHOLSON, A. C.
RANSOME, E. C.
SAMPLE, C. H.
STEDMAN, L. F.
WEBB, S. OWEN
The Steward of Implements

Showyard Works Committee.

BURKE, U. ROLAND (*Chairman*)
DARESBURY, Lord
BURRELL, Sir MERRIK
HAZLERIGG, Sir A.
BELL, JOHN
BURKITT, W.
BURRELL, WALTER R.
CRUTCHLEY, PERCY
EVERETT, Major N.
HALL, J. H.
NEILSON, R. B.
NICHOLSON, A. C.
SAMPLE, C. H.
STANYFORTH, Lt.-Col.
STEDMAN, L. F.
WEBB, S. OWEN
WHEATLEY, Col.

Dairy and Produce Committee.

BURKITT, W. (*Chairman*)
SHAFTESBURY, Earl of
BURRELL, Sir MERRIK
DAMPIER, Sir W. C. D.
WEIGALL, Sir A. G.
CRUTCHLEY, PERCY
EVENS, JOHN
GREAVES, R. M.
JOHNSTONE, Capt. G. H.
KAY, Dr. H. D.
SMITH, FRED

Horticultural Committee.

HAZLERIGG, Sir A. (*Chairman*) DARESBURY, Lord BURKE, U. ROLAND

General Newcastle Committee.

The Whole Council, with representatives of the Local Committee.

Honorary Director.—U. ROLAND BURKE.

Secretary.—T. B. TURNER, 16 Bedford Square, London, W.C.1.

Editor of Journal.—Prof. J. A. SCOTT WATSON, *School of Rural Economy, Oxford.*

Consulting Chemist.—Dr. J. AUGUSTUS VOELCKER, C.S.I., M.A., 1 *Tudor Street, London, E.C.4.*

Consulting Veterinary Surgeon.—Prof. Sir F. T. G. HOBDAY, C.M.G., F.R.C.V.S., *Royal Veterinary College, Camden Town, London, N.W.1.*

Botanist.—Prof. Sir R. H. BIFFEN, F.R.S., *School of Agriculture, Cambridge.*

Zoologist.—CECIL WARBURTON, M.A., *School of Agriculture, Cambridge.*

Consulting Engineer.—S. J. WRIGHT, B.A., *Institute of Agricultural Engineering,* 37A *St. Giles, Oxford.*

Surveyor.—CHARLES H. R. NAYLOR, *St. Mary's Chambers, Queen Street, Derby.*

Publisher.—JOHN MURRAY, 50A *Albemarle Street, W.1.*

Solicitors.—GARRARD, WOLFE, GAZE & CLARKE, 18 *St. James's Place, S.W.1.*

Bankers.—WESTMINSTER BANK, LTD., 1 *St. James's Square, S.W.1.*

DISTRIBUTION OF GOVERNORS AND MEMBERS OF THE SOCIETY, AND OF ORDINARY MEMBERS OF THE COUNCIL.

Electoral District.	Division.	Number of Governors and Members.	Number of Ordinary Members of Council.	Ordinary Members of Council.
A.	Bedfordshire	69	1	Frank Webb.
	Cheshire	412	2	J. H. Hall; R. B. Neilson.
	Cornwall	66	1	Capt. G. H. Johnstone.
	Derbyshire	273	2	U. Roland Burke; Sir Ian Walker, Bart.
	Dorset	89	1	Earl of Shaftesbury.
	Hampshire and Channel Islands	285	2	Major F. H. T. Jervoise; Capt. J. B. Scott.
	Hertfordshire	174	1	E. E. Barclay.
	Lancashire and Isle of Man	293	2	Windham E. Hale; Lord Stanley
	Middlesex	59	1	Earl of Strafford.
	Monmouthshire	52	1	L. Foster Stedman.
	Norfolk	293	2	Capt. H. G. Buxton; Lord Hastings.
	Northamptonshire	175	1	F. H. Thornton.
	Northumberland	233	1	C. H. Sample.
	Staffordshire	193	1	W. W. Ryman.
	Worcestershire	120	1	John Walker.
	Yorkshire, N.R.	206	1	Major Clive Behrens.
	Scotland	263	2	Earl of Elgin; James Kilpatrick.
		3,255	23	
B.	Buckinghamshire	123	1	B. J. Gates.
	Devon	154	1	Sir J. F. Shelley, Bart.
	Durham	131	1	W. Burkitt.
	Essex	244	1	Sir Walter Gilbey, Bart.
	Herefordshire	136	1	William Smith.
	Leicestershire	186	1	W. Lindsay Everard.
	London	408	2	John Bell; Sir A. G. Weigall.
	Nottinghamshire	176	1	Thomas Forshaw.
	Rutland	41	1	E. Guy Fenwick.
	Shropshire	266	1	E. Craig Tanner.
	Suffolk	439	2	Major Norman Everett; Fred Smith.
	Surrey	193	1	R. Borlase Matthews.
	Wiltshire	153	1	Earl of Radnor.
	Yorkshire, W.R.	276	1	C. W. H. Glossop.
	South Wales	77	1	Capt. H. A. Christy.
		3,003	17	
C.	Berkshire	194	1	H. A. Benyon.
	Cambridgeshire	193	1	S. Owen Webb.
	Cumberland	127	1	Joseph Harris.
	Glamorgan	56	1	Hubert Alexander.
	Gloucestershire	253	1	Major C. C. Hansford.
	Huntingdonshire	28	1	Lord Eltisley of Croxton.
	Kent	286	2	Thomas Neame; J. E. Quested.
	Lincolnshire	273	2	John Evens; Eustace Abel Smith.
	Oxfordshire	146	1	Robert Hobbs.
	Somerset	137	1	Robert Bruford.
	Sussex	315	2	Walter R. Burrell; Sir G. L. Courthope, Bart.
	Warwickshire	261	1	Col. C. J. H. Wheatley.
	Westmorland	71	1	Jacob Wakefield.
	Yorkshire, E.R.	104	1	T. L. Wickham-Boynton.
	Ireland	60	1	Edward Bohane.
	North Wales	201	1	Major W. Marshall Dugdale.
		2,705	19	
Foreign Countries		188		*Sir W. C. D. Dampier.
				*Alfred Mansell.
Members with no Addresses		18	5	*A. C. Nicholson.
				*E. C. Ransome.
Grand Totals		9,169	66	*Sir John Russell.

* Nominated Members of Council.

Table showing the Number of GOVERNORS and MEMBERS in each year from the Establishment of the Society.

Year.	President of the Year.	Governors.		Members.			Total.
		Life.	Annual.	Life.	Annual.	Honorary.	
1839	3rd Earl Spencer	—	—	—	—	—	1,100
1840	5th Duke of Richmond	86	189	146	2,434	5	2,860
1841	Mr. Philip Pusey	91	219	231	4,047	7	4,595
1842	Mr. Henry Handley	101	211	328	5,194	15	5,849
1843	4th Earl of Hardwicke	94	209	429	6,155	15	6,902
1844	3rd Earl Spencer	95	214	442	6,161	15	6,927
1845	5th Duke of Richmond	94	198	527	5,899	15	6,733
1846	1st Viscount Portman	92	201	554	6,105	19	6,971
1847	6th Earl of Egmont	91	195	607	5,478	20	6,391
1848	2nd Earl of Yarborough	93	186	648	5,387	21	6,335
1849	3rd Earl of Chichester	89	178	582	4,643	20	5,512
1850	4th Marquis of Downshire	90	169	627	4,356	19	5,261
1851	5th Duke of Richmond	91	162	674	4,175	19	5,121
1852	2nd Earl of Ducie	93	156	711	4,002	19	4,981
1853	2nd Lord Ashburton	90	147	739	3,928	19	4,923
1854	Mr. Philip Pusey	88	146	771	4,152	20	5,177
1855	Mr. William Miles, M.P.	89	141	795	3,838	19	4,882
1856	1st Viscount Portman	85	139	830	3,896	20	4,979
1857	Viscount Ossington	83	137	896	3,933	19	5,068
1858	6th Lord Berners	81	133	904	4,010	18	5,146
1859	7th Duke of Marlborough	78	130	927	4,008	18	5,161
1860	5th Lord Walsingham	72	119	927	4,047	18	5,183
1861	3rd Earl of Powis	84	90	1,113	3,828	18	4,633
1862	H.R.H. The Prince Consort 1st Viscount Portman	83	97	1,151	3,475	17	4,823
1863	Viscount Eversley	80	88	1,263	3,785	17	5,188
1864	2nd Lord Feversham	78	45	1,343	4,013	17	5,496
1865	Sir E. C. Kerrison, Bart., M.P.	79	81	1,386	4,190	16	5,752
1866	1st Lord Tredegar	79	84	1,395	4,049	15	5,622
1867	Mr. H. S. Thompson	77	82	1,388	3,903	15	5,465
1868	6th Duke of Richmond	75	74	1,409	3,888	15	5,461
1869	H.R.H. The Prince of Wales, K.G.	75	73	1,417	3,864	17	5,446
1870	7th Duke of Devonshire	74	74	1,511	3,764	15	5,436
1871	6th Lord Vernon	72	74	1,589	3,896	17	5,648
1872	Sir W. W. Wynn, Bart., M.P.	71	73	1,655	3,953	14	5,768
1873	3rd Earl Cathcart	74	62	1,832	3,936	12	5,916
1874	Mr. Edward Holland	76	58	1,944	3,756	12	5,846
1875	1st Viscount Bridport	79	79	2,058	3,918	11	8,145
1876	2nd Lord Chesham	83	78	2,164	4,013	11	6,349
1877	Lord Skelmersdale	81	76	2,239	4,073	17	6,486
1878	Col. Kingscote, C.B., M.P.	81	72	2,328	4,130	26	6,637
1879	H.R.H. The Prince of Wales, K G.	81	72	2,453	4,700	26	7,332
1880	9th Duke of Bedford	83	70	2,673	5,083	20	7,929
1881	Mr. William Wells	85	69	2,765	5,011	19	7,979
1882	Mr. John Dent Dent	82	71	2,849	5,059	19	8,080
1883	6th Duke of Richmond and Gordon	78	71	2,979	4,952	19	8,099
1884	Sir Brandreth Gibbs	72	72	3,203	5,408	21	8,776
1885	Sir Massey Lopes, Bart., M.P.	71	69	3,356	5,619	20	9,135
1886	H.R.H. The Prince of Wales, K.G.	70	61	3,414	5,569	20	9,134
1887	Lord Egerton of Tatton	71	64	3,440	5,387	20	8,982
1888	Sir M. W. Ridley, Bart., M.P.	66	56	3,521	5,225	16	8,884
1889	Her Majesty Queen Victoria	73	58	3,567	7,153	15	10,866
1890	Lord Moreton	122	58	3,846	6,941	17	10,984
1891	2nd Earl of Ravensworth	117	60	3,811	6,921	19	10,928
1892	1st Earl of Feversham	111	69	3,784	7,066	20	11,050
1893	1st Duke of Westminster, K.G.	107	74	3,786	7,138	21	11,126
1894	8th Duke of Devonshire, K.G.	113	73	3,798	7,212	22	11,218
1895	Sir J. H. Thorold, Bart.	120	80	3,747	7,179	23	11,149
1896	Sir Walter Gilbey, Bart.	126	83	3,695	7,253	23	11,180
1897	H.R.H. The Duke of York, K.G.	126	83	3,705	7,285	24	11,223
1898	5th Earl Spencer, K.G.	121	79	3,687	7,182	25	11,094
1899	Earl of Coventry	116	75	3,656	7,009	23	10,879
1900	H.R.H. The Prince of Wales, K.G.	111	71	3,628	6,832	24	10,666
1901	3rd Earl Cawdor	102	70	3,564	6,838	27	10,033
1902	H.R.H. Prince Christian, K.G.	100	69	3,500	5,955	26	9,650
1903	H.R.H. The Prince of Wales, K.G.	99	62	3,439	5,771	27	9,398
1904	16th Earl of Derby, K.G.	96	68	3,375	5,906	32	9,477
1905	9th Lord Middleton	89	78	3,212	5,758	33	9,170
1906	Mr. F. S. W. Cornwallis	94	155	3,182	6,189	30	9,600

TABLE SHOWING THE NUMBER OF GOVERNORS AND MEMBERS IN EACH YEAR FROM THE ESTABLISHMENT OF THE SOCIETY—*contd.*

Year.	President of the Year.	Governors.		Members.			Total.
		Life.	Annual.	Life.	Annual.	Honorary.	
1907	Earl of Yarborough . . .	91	174	3,076	6,299	29	9,669
1908	Duke of Devonshire . . .	89	178	3,019	6,442	30	9,758
1909	7th Earl of Jersey, G.C.B. . .	91	177	2,951	6,696	31	9,946
1910	Sir Gilbert Greenall, Bart. . .	86	166	2,878	6,934	31	10,095
1911	HIS MAJESTY KING GEORGE V .	85	168	2,805	7,191	30	10,279
1912	9th Lord Middleton . . .	85	170	2,741	7,283	30	10,309
1913	2nd Earl of Northbrook . . .	89	168	2,691	7,474	26	10,448
1914	Earl of Powis	89	173	2,626	7,629	28	10,545
1915	Duke of Portland, K.G. . [K.G.	88	184	2,517	7,313	28	10,130
1916	7th Duke of Richmond and Gordon,	83	185	2,427	7,526	27	10,248
1917	Mr. Charles Adeane, C.B. . .	93	210	2,412	8,214	26	10,955
1918	Hon. Cecil T. Parker . . .	102	224	2,395	8,226	25	10,972
1919	Sir J. B. Bowen-Jones, Bart. . .	119	236	2,411	8,558	24	11,348
1920	H.R.H. The Prince of Wales, K.G. .	129	256	2,402	9,208	25	12,020
1921	Mr. R. M. Greaves	137	275	2,374	10,098	24	12,908
1922	H.R.H. The Duke of York, K.G. .	144	287	2,317	10,596	22	13,366
1923	Lt.-Col. E. W. Stanyforth . .	153	293	2,262	10,778	20	13,506
1924	Mr. Ernest Mathews, C.V.O. . .	159	289	2,201	10,676	21	13,346
1925	Sir Gilbert Greenall, Bart., C.V.O. .	158	291	2,160	10,949	15	13,573
1926	Lord Desborough, G.C.V.O. . .	155	276	2,103	10,251	15	12,800
1927	Viscount Tredegar, C.B.E. . .	153	257	2,035	9,343	15	11,803
1928	Lord Harlech, C.B. . . .	155	277	1,972	9,042	16	11,462
1929	Earl of Harewood, K.G. . . .	154	273	1,914	8,813	16	11,170
1930	H.R.H. The Duke of Gloucester, K.G.	158	264	1,882	8,491	16	10,811
1931	Sir Arthur Hazlerigg, Bart. . .	153	245	1,823	8,036	16	10,273
1932	Lord Mildmay of Flete . . .	144	223	1,774	7,501	13	9,655
1933	Duke of Devonshire, K.G. . .	140	212	1,707	7,367	13	9,439
1934	Earl of Stradbroke, K.C.M.G. . .	140	205	1,666	7,141	17	9,169

STATEMENT made to the Council by the Chairman of the Finance Committee, on presenting the Accounts for the year 1933.

Mr. ADEANE said that he had now to lay before the Council the Accounts and the Balance Sheet, which had been duly audited. The Society began the year with a balance of £2,339. The ordinary receipts during the year totalled £15,982; other receipts amounted to £1,000, making a total of £16,982, apart from £22,554 received from sales of investments. This gave a total on the receipts side of £41,875. Compared with 1932, the receipts from subscriptions declined by £140, interest on investments by £471, and interest on daily balance and deposit account by £185. The revenue from subscriptions continued to decline, but the position had improved during the past year, and the loss under this head was less. The Council would be glad to know that the new members elected last year numbered 612, as against 378 in 1932. The number in 1933 was the highest recorded since 1929. The decline in the revenue from investments was due chiefly to the War Loan conversion, and the decline in the interest on daily balances and deposit account to the very low bank rate prevailing.

The ordinary expenditure was £14,715, and there was extraordinary expenditure amounting to £406, in addition to £22,927 which was invested, making a total of £38,048. The balance carried forward was £3,827.

With regard to the Balance Sheet, in 1932 the Reserve Fund showed an appreciation of £43,244; since then there had been a further apppreciation of £5,033, which, together with the addition of £3,873 in 1933, made a total reserve figure of £199,194 which was very nearly the figure, namely, £200,000, they all hoped to attain. He trusted that this figure would be reached during the present year. A further investment of £1,394 had been made. This sum would have been placed on deposit, but owing to the low rate of interest it was considered advisable to invest it in a stock which would be easily realised if necessary when the result of the Ipswich Show was known.

With regard to the estimates for 1934, the receipts were estimated at £16,231, and the expenditure at £15,548, leaving an estimated surplus of receipts over expenditure of £683.

Receipts.

Figures for 1932 £		£ s. d.	£ s. d.	£ s. d.
	CASH AT BANKERS AND IN HAND, JANUARY 1, 1933:—			
300	Reserve Fund Account		4 0 0	
1,979	Current Account		2,150 6 5	
154	Petty Cash at Bank and in hand		185 1 6	
				2,339 7 11
2,433				
	ANNUAL SUBSCRIPTIONS :—			
1,186	*Governors'* for 1933	1,200 0 0		
7,685	*Members'* for 1933	7,402 1 5		
52	Subscriptions for previous years	90 14 0		
	LIFE GOVERNORS AND MEMBERS :—			
27	Annual Contributions	27 7 0	8,810 2 5	
8,950				
	MISCELLANEOUS :—			
6,838	Interest on Investments	6,866 19 3		
65	Income Tax refunded	65 5 8		
246	Interest on Daily Balances and Deposit Account	61 7 1		
31	Sales of Pamphlets, Farm Account Books, etc.	27 19 10		
—	Sales of Library Catalogue	1 13 3		
58	Sales of Text Book	109 0 6		
87	Sales of Journals	71 5 0		
148	Advertisements in Journal	153 6 2		
179	N.D.D.: Entry Fees and Sales of Exam. Papers	188 13 3		
27	Hire of Council and Committee rooms	36 15 0		
7,679			7,172 5 0	
16,629	Total of Ordinary Receipts			15,982 7 5
205	Life Compositions of Governors and Members		468 0 0	
107	Donations to Society's Funds		103 12 0	
120	Subscriptions for 1934		162 14 0	
53	Argentine Rural Society		100 0 0	
143	Refunded in respect of payments to Willesden Corporation		164 2 8	
8	Show Account: for amount owing on Dec. 31, 1932		1 14 6	
153	*Bonus on Conversion of 5% War Stock*		—	
1,697	*Amount transferred from Deposit Account*		—	
—	Investments sold		22,554 1 0	23,554 4 2
2,486				
£21,548				£41,875 19 6

Payments.

Figures for 1932. £	Payments.	£ s. d.	£ s. d.	£ s. d.
	General Administration:—			
4,220	Salaries: Secretary and Official Staff (including clerical assistance)	4,095 9 9		
284	Pension to late Secretary (part cost)	367 18 4		
302	Legal Charges and Auditors' Fees, etc.	282 10 6		
1,026	Rent, Rates, Taxes, Insurance and House Expenses	1,026 0 9		
316	Printing and Stationery	372 18 1		
132	Postage	140 12 11		
192	Telephones, Telegrams and Miscellaneous Expenses	166 2 6		
6,472			6,451 7 10	
	Journal of the Society:—			
	Cost of Volume 93:—			
1,049	Printing and Binding	632 5 1		
257	Postage	242 14 8		
464	Editing and Literary Contributions	385 9 0		
19	Illustrations	16 7 8		
1,789		1,276 16 5		
5	On account of Volume 94, £28 4*s.* 0*d.*; and moving Blocks, etc., from old printer £61 18*s.* 8*d.*	89 17 8		
1,794			1,366 14 1	
	Laboratory:—			
409	Salary and Petty Cash		409 10 6	
	Other Scientific Departments:—			
250	Botanist's Salary	250 0 0		
200	Zoologist's Salary	200 0 0		
400	Grant to Royal Veterinary College	400 0 0		
50	Grant to Research Institute, Reading	50 0 0		
3	Medal for Proficiency in Cattle Pathology	2 11 9		
903			902 11 9	
	National Diploma in Agriculture:—			
311	Honoraria and Expenses of Examiners	285 19 0		
83	Travelling Expenses of Officials, etc.	69 0 0		
112	Hotel Expenses of Examiners, Officials, etc.	113 19 10		
88	Printing, Stationery, Diplomas and Postage	59 18 8		
7	Hire of Premises	7 7 0		
75	Allowance for Assistant	75 0 0		
676		611 4 1		
556	*Less* Entry Fees and Sales of Examination Papers	436 4 6		
120		174 19 7		
60	*Less* amount paid by Highland and Agricultural Society	87 2 10		
60			87 16 9	
	National Diploma in Dairying:—			
116	Honoraria and Expenses of Examiners	137 1 8		
84	Hotel and Travelling Expenses	79 4 1		
62	Printing, Diplomas, Postage, and allowance for assistant	62 6 2		
20	Hire of Premises and balance of Expenses *re* 1932 Exam.	49 6 1		
	(For Entry Fees, Sales of Exam. Papers, etc., see contra.)			
282			327 18 0	
	Extra Expenditure:—			
1,484	Grant to Research Fund	1,202 8 8		
27	Library: Binding and Purchase of Books	20 2 9		
—	New Boiler, etc.	38 15 0		
—	Cleaning Library and Books	15 15 0		
6	Repairs to Furniture and Presidential Board	52 6 6		
2	Certificates and Medals for Long Service	2 10 10		
1,340	New Text Book: "Elements of Agriculture"	113 19 9		
94	Dinner to Secretaries of Breed Societies	92 18 3		
—	Donation to National Fedn. of Young Farmers' Clubs	26 5 0		
—	Donation re Wisley Fruit Trials	50 0 0		
—	Luncheon to Argentine Delegation	54 4 1		
2,953			1,669 5 10	
3,500	Amount set aside towards Loss on Shows		3,500 0 0	
16,373	Total of Ordinary Payments			14,715 4 9
6	Argentine Rural Society		100 0 0	
270	Payments to Willesden Corporation		303 0 8	
25	*Additions to Show Plant*		—	
33	*Additions to Furniture and Equipment*		—	
2	Show Account: for Postage, etc. (Dec., 1933)		2 16 0	
2,500	Investments purchased		22,927 1 0	
2,836				23,332 17 8
	Cash at Bankers and in Hand, December 31st, 1933:—			
4	Reserve Fund Account		79 0 0	
2,150	Current Account		3,569 6 10	
185	Petty Cash at Bank and in Hand		179 10 3	
2,339				3,827 17 1
£21,548				£41,875 19 6

Examined, audited and found correct,

3 Frederick's Place,
Old Jewry, London, E.C.2.
13th February, 1934.

Price, Waterhouse & Co.,
Chartered Accountants,
Accountants & Auditors.

Dr. BALANCE SHEET,

Figures for 1932. £		£ s. d.	£ s. d.	£ s. d.
	To SUNDRY CREDITORS—			
1,803	Sundry Accounts owing		2,157 1 4	
120	Subscriptions received in 1933 but belonging to 1934		162 14 0	
				2,319 15 4
1,923				
	To CAPITAL and RESERVE FUND—			
158,136	As at December 31, 1932		197,273 3 0	
(*Loss*) 7,802	SHOW FUND— Surplus on Derby Show	1,394 2 11		
(*Less*) 3,500	*Add*: contribution from Ordinary Account .	3,500 0 0		
(*Less*) 4,302			4,894 2 11	
153,834			202,167 5 11	
205	Life Compositions received in 1933		468 0 0	
107	Donations towards the Society's Funds . .		103 12 0	
148	Subscriptions for 1933 received in 1932 . .		120 10 0	
153	*Bonus on Conversion of* 5% *War Stock* . .		—	
256	Excess of ordinary receipts over payments for the year 1933		1,267 2 8	
154,703			204,126 10 7	
43,244	*Add*: Appreciation in market values of Investments		5,032 11 0	
197,947			209,159 1 7	
234	*Less*: Adjustment in respect of outstanding Assets and Liabilities		126 3 11	
197,713			209,032 17 8	
	DEPRECIATION written off, viz.:—			
10	Fixtures	9 2 8		
30	Furniture	30 3 9		
300	Show Plant	272 18 3		
100	Lease of 16 Bedford Square	100 0 0		
			412 4 8	
440				208,620 13 0
197,273				
£199,196				£210,940 8 4

NOTE—There are commitments in respect of Contracts entered into in connexion with the forthcoming Show.

T. B. TURNER,
Secretary.

DECEMBER 31, 1933. *Cr.*

Figures for 1932. £		£ s. d.	£ s. d.
	By RESERVE FUND INVESTMENTS—		
153,063	154,609*l.* 4*s.* 11*d.* Conversion Loan 3½ per cent. (1961) @ 101¾*	157,814 18 2	
840	*767l. 4s. 7d. Conversion Loan 4½ per cent.* (1940–44) @ 109½	—	
3,402	3,909*l.* 16*s.* Local Loans 3 per cent. (1912) @ 87*	3,401 10 6	
2,841	2,840*l.* 18*s.* 6*d.* Metropolitan 3 per cent. Consolidated Stock (1941) @ 101½*	2,883 5 8	
6,789	6,528*l.* 1*s.* 6*d.* Dominion of Canada 4 per cent. Stock (1940–60) @ 103*	6,723 18 4	
15,103	15,294*l.* 13*s.* 2*d.* *War Loan 3½ per cent.* (1952) @ 98¾	—	
5,750	5,000*l.* *Conversion Loan 5 per cent.* (1944–64) @ 115	—	
2,500	2,724*l.* 11*s.* 7*d.* Metropolitan Water 3 per cent. (E) Stock (1953–73) @ 95*	2,588 7 0	
—	12,234*l.* 12*s.* 5*d.* Commonwealth of Australia 4% Stock (1955–70) @ 104*	12,724 0 2	
—	6,800*l.* 14*s.* 2*d.* Union of S. Africa 3½% Stock (1953–73) @ 99*	6,732 14 0	
—	6,500*l.* 0*s.* 0*d.* Dominion of Canada 4% Stock (1953–58) @ 105*	6,825 0 0	199,193 13 10
190,288	* Market value at December 31, 1933.		
	By OTHER INVESTMENT—		
—	1,400*l.* 8*s.* 9*d.* Commonwealth of Australia 3¾% Stock (1946–49) at cost		1,394 2 11
	By LEASE OF 16 BEDFORD SQUARE	400 0 0	
	Less Amount written off in 1933	100 0 0	
400			300 0 0
	By FIXTURES, FITTINGS, etc.—		
	As at December 31, 1932	121 15 6	
	Less Depreciation at 7½ per cent.	9 2 8	
122			112 12 10
	By FURNITURE—		
	As at December 31, 1932	301 17 5	
	Less Depreciation at 10 per cent.	30 3 9	
302			271 13 8
1,500	By PICTURES (500*l.*) and BOOKS (1,000*l.*)		1,500 0 0
	By SHOW PLANT—		
	As at December 31, 1932	2 729 2 2	
	Less Depreciation at 10 per cent.	272 18 3	
2,729			2,456 3 11
1,076	By EXPENDITURE (less amounts received) on IPSWICH SHOW		1,843 16 5
400	By SUNDRY DEBTORS		477 2 2
77	By RATES PAID IN ADVANCE AND INCOME TAX RECOVERABLE		106 12 8
	By CASH AT BANKERS AND IN HAND— *ORDINARY ACCOUNT—*		
4	Reserve Fund Account	79 0 0	
2,150	Current Account	3,569 6 10	
185	Petty Cash at Bank and in Hand	179 10 3	
2,339		3,827 17 1	
37	*Less* SHOW ACCOUNT—Overdrawn	542 7 2	
2,302			3,285 9 11
£199,196			£210,940 3 4

Examined, audited and found correct,

3 FREDERICK'S PLACE, OLD JEWRY, LONDON, E.C.2.
13*th February,* 1934.

PRICE, WATERHOUSE & CO.,
Chartered Accountants,
Accountants & Auditors

Royal Agricultural Society of England.

STATEMENTS OF FUNDS HELD BY THE SOCIETY IN TRUST OR WHICH ARE NOT CONSIDERED AVAILABLE FOR GENERAL PURPOSES, DECEMBER 31, 1933.

E. H. Hills' Bequest.

	£ s. d.	£ s. d.		£ s. d.
To amount bequeathed for Pot-culture Experiments .		9,000 0 0	By 7,222*l.* 15*s.* 0*d.* 3½% Conversion Loan Stock (1961) (purchased on sale of War Loan Stock) at cost .	5,616 1 10
Less: Depreciation of Consols at time of conversion . .	3,582 7 11		(*Value December* 31, 1933, at 101¾ = £7,349 3*s.* 0*d.*)	
„ Cost of conversion . .	134 14 7			
		3,717 2 6		
		5,282 17 6		
To surplus on sale of 5% War Loan Stock		333 4 4		
		£5,616 1 10		£5,616 1 10

Queen Victoria Gifts Fund.

	£ s. d.		£ s. d.
To Fund invested (the income from this Fund is used to make Annual Grants to unsuccessful applicants for pension through the Royal Agricultural Benevolent Institution)	5,000 0 0	By Investments in names of Trustees: at cost:	
Undistributed Income	66 15 9	1,000*l.* Dominion of Canada 3% Inscribed Stock .	1,062 14 0
		1,000*l.* Victorian Government 5% Inscribed Stock 1932–42	1,070 4 4
		1,000*l.* New South Wales Government 5% Inscribed Stock, 1935–55	1,095 5 6
		1,000*l.* London Midland & Scottish Railway Consolidated 4% Guaranteed Stock	1,556 15 9
		190*l.* 4*s.* 6*d.* 2½% Consols	215 0 5
			5,000 0
		By Cash at Bank, December 31, 1933 . . .	66 1 9
	£5,066 15 9		£5,066 15 9

The market values of the Stocks on December 31, 1933, amounted to £4,155 15*s.* 4*d.*

STATEMENT OF FUNDS HELD BY THE SOCIETY IN TRUST—*continued.*

Gilbey Fund.

	£ s. d.
To Amount provided by the late Sir Walter Gilbey for endowment of Lectureship at Cambridge University	1,000 0 0
Accumulation of Interest	204 10 4
	£1,204 10 4

	£ s. d.
By Investment at cost:— 1,457*l.* 5*s.* 2*d.* Metropolitan Water "A" Stock . (*Value on December* 31, 1933, at 88=£1,282 7*s.* 9*d.*)	1,204 10 4
	£1,204 10 4

Superannuation and Insurance Fund.

	£ s. d.	£ s. d.	£ s. d.
To amount set aside in accordance with declaration of Trust of July 26, 1911		9,171 5 0	
Less: Depreciation of Consols at time of conversion .	1,837 18 4		
„ Cost of conversion .	256 3 0		
		2,094 1 4	
			7,077 3 8
Add: Purchase of 1,367*l.* 14*s.* 9*d.* 5% War Loan Stock at cost			1,167 0 0
			8,244 3 8
Accumulation to Dec. 31, 1932 . .		1,546 10 2	
Income for 1933 . .	351 12 8		
Less: Premiums paid, Income Tax and share of pension	294 3 7		
		57 9 1	
			1,603 19 3
Income Tax on War Stock Interest . . .			80 18 9
			£9,929 1 8

	£ s. d.
By Investments in names of Trustees, at cost:—	
£9,028 0*s.* 7*d.* 3½% War Loan Stock (1952) . . (converted from 5% Stock, July 1932.)	8,453 7 8
728*l.* 2*s.* 4*d.* West Australian 3½% Stock (1935–55)	559 17 4
717*l.* 14*s.* 4*d.* Queensland 3½% Stock (1950–70) .	541 15 6
	9,555 0 6
By Cash at Bank, December 31, 1933 . . .	374 1 2
(Note—The market values of the Stocks on Dec. 31 1933, amounted to £10,528 19*s.* 8*d.*)	
	£9,929 1 8

"Merchants of the Staple of England" Fund.

	£ s. d.
To capital sum paid by the "Merchants of the Staple of England" for the purpose of providing out of the yearly income Prizes to be competed for annually in the Wool Section of the Royal Show . .	500 0 0

	£ s. d.
By Investment at cost:— 503*l.* 1*s.* 9*d.* New South Wales Government 5% Inscribed Stock, 1935–55	500 0 0
(Value on Dec. 31, 1933, at 103 = £518 3*s.* 7*d.*)	

3 Frederick's Place,
Old Jewry, London, E.C.2.
18*th February*, 1984.

Examined, audited and found correct,
Price, Waterhouse & Co.,
Chartered Accountants,
Accountants & Auditors.

Royal Agricultural Society of England.

RESEARCH COMMITTEE.

RECEIPTS AND PAYMENTS FOR YEAR 1933.

Receipts.

	£	s.	d.
To Grant from General Account	1,202	8	8
,, Sales of copies of *Farmer's Guide to Agricultural Research*	31	2	9
,, Advertisements in *Farmer's Guide to Agricultural Research in* 1931	95	8	5
	£1,328	19	10

Payments.

	£	s.	d
By Grants to Research Institute in Animal Pathology, Royal Veterinary College, for Research *re* Mastitis in Cows	300	0	0
,, Grants to Rothamsted Experimental Station for:—			
Lucerne Seed Inoculation Experiments	50	0	0
Electricity on the Farm Investigation	100	0	0
Collating Woburn Farm data	125	0	0
,, Grant to Norfolk Agricultural Station for disposal of Sugar Beet By-Products	300	0	0
,, Editing, etc.	20	0	0
,, *Farmers' Guide to Agricultural Research in* 1932 :—			
Honoraria to Contributors and Editor	430	0	0
,, Postage on copies sold of *Farmers' Guide to Agricultural Research*	3	19	10
	£1,328	19	10

Examined, audited and found correct,
PRICE, WATERHOUSE & CO.,
Chartered Accountants,
Accountants & Auditors.

3 FREDERICK'S PLACE,
OLD JEWRY, LONDON, E.C.2.
13th February, 1934.

STATEMENT made to the Council by the Chairman of the Finance Committee, on presenting the Audited Accounts of the Ipswich Show, 1934.

Mr. ADEANE said that the Show Accounts as presented this year were in a slightly altered form, on which he desired to make a short explanation. Owing to the great detail previously given in the old accounts and the large amount of space required, the type was necessarily so small as to cause inconvenience. The Finance Committee had gone very carefully into the matter and recommended their simplification. By this simplification a mass of unnecessary detail had been done away with and it had been made possible to have the Accounts printed in larger type. The Accounts would still be kept in the Office in the same detail as before, so that anyone who wished to do so could inspect them.

The items on the Receipts side were reduced from 60 to 31, and on the Expenditure side from 83 to 44. In several cases returns had been brought in under more appropriate headings; for example, the Clerk of Works had been put under the heading "Surveyor"; the cost of the Dairy building under the heading of "Dairy," etc. These changes made it impossible this year to publish detailed comparative figures for the previous Show as heretofore, with the exception of the final result; but next year these would be given.

Whereas the Receipts at Ipswich showed an increase of £7,690 as compared with Derby, the Expenditure showed only an increase of £855, which was very satisfactory. One remarkable saving was £1,467 on advertising, and this was due largely to the Ipswich Local Committee, who took over the billposting and local publicity and did it remarkably well. In this connection he wished to mention the assistance given by Mr. Clarke and the *East Anglian Daily Times*. He would not trouble the Council with any more figures. The surplus on the Ipswich Show was £8,228 compared with £1,394 at Derby.

It must be a pleasure for the President to know that the Show at Ipswich was one of most outstanding success. Whatever fears and forebodings there might have been in the initial stages, they were soon dispelled. The enthusiasm and goodwill not only of Suffolk, but also of the adjoining counties of Norfolk and Essex, combined with the efforts of the President, created an atmosphere which was very beneficial and helped the Society to a fine result.

Their thanks were due to the President not only for the manner in which he had presided over the Council, but also for the great energy which he put into everything connected with the Show; also to all those who assisted him, especially Mr. Philip Cobbold, as Mayor of Ipswich and Chairman of the Local Committee, Lord Cranworth, Hon. Treasurer, and Mr. Moffat, Town Clerk, and the town of Ipswich, which gave the Society a very hospitable welcome.

The work put upon the Honorary Director, Mr. Burke, and Mr. Turner, the Secretary, in organising the Show was enormous, and, but for their energy and ability and the willing backing they received from the Staff, it could not have been carried out. To all of these the Council would like to tender its warmest thanks.

STATEMENT OF RECEIPTS AND EXPENDI-

JULY 3 to

Receipts.

	£ s. d.	£ s. d.
CONTRIBUTION FROM IPSWICH LOCAL COMMITTEE TO SHOW FUND		2,000 0 0
CONTRIBUTIONS TO PRIZE FUND :—		
Agricultural and Breed Societies and others ..	2,706 13 0	
Ipswich Local Committee	1,550 0 0	
		4,256 13 0
FEES FOR IMPLEMENTS, MACHINES AND MISCELLANEOUS EXHIBITS		11,348 9 10
FEES FOR ENTRY OF LIVE STOCK :—		
Members	7,453 0 0	
Non-members	444 0 0	
		7,897 0 0
FEES FOR ENTRY OF POULTRY		206 16 0
OTHER ENTRY FEES :—		
Produce	93 14 0	
Horse-jumping Competitions	112 0 0	
Plantations and Orchards Competitions	29 7 0	
Butter-Making Competitions	21 15 0	
		256 16 0
CATALOGUE :—		
Advertising in Catalogue and extra lines	958 12 6	
Sales of Catalogue	901 13 3	
Sales of Jumping Programmes	52 3 6	
		1,912 9 3
ADMISSIONS TO SHOWYARD :—		
Tuesday, July 3, at 5*s*.	1,107 5 0	
Wednesday, July 4, at 5*s*. and 3*s*.	4,372 5 9	
Thursday, July 5, at 3*s*. .... .., ...	5,184 5 3	
Friday, July 6, at 2*s*. 6*d*.	2,307 8 7	
Saturday, July 7, at 1*s*.	828 2 1	
Season Tickets	233 11 11	
Day Tickets	1,592 12 5	
		15,625 11 0
ADMISSIONS TO GRAND STAND :—		
Reserved Seats	840 3 0	
Unreserved Seats	1,091 10 6	
		1,931 13 6
Carried forward		£45,435 8 7

TURE OF THE SHOW AT IPSWICH,
JULY 7, 1934.

Expenditure.

	£	s.	d.	£	s.	d.
COST OF ERECTION AND MAINTENANCE OF SHOW-YARD :—						
Transferring Society's permanent buildings from Derby and re-erecting at Ipswich	2,747	17	0			
Fencing round Showyard	563	6	5			
Implement Shedding	1,989	4	3			
Stock Shedding	6,171	10	10			
Grand Stand, Offices, Rings, Signs, etc.	2,068	1	3			
General Labour and Horse Hire	844	12	10			
Hire of Sleepers	159	14	4			
Hire of Canvas	2,275	18	1			
				16,820	5	0
SURVEYOR :—						
Salary, Travelling and Sundry Expenses	674	11	6			
Clerk of Works : Salary and travelling	298	6	7			
				972	18	1
PRINTING :—						
General Printing, Prize Sheet, Tickets, etc. ...	598	13	6			
Catalogue, Award Lists and Jumping Programmes	921	1	8			
				1,519	15	2
ADVERTISING :—						
Newspaper Advertising	580	1	9			
Billposting and Window Cards, etc.	309	15	7			
Advertisement Boards	116	17	0			
				1,006	14	4
POSTAGE, CARRIAGE, ETC.				197	0	6
AMOUNT OF PRIZES AWARDED (including £4,256 13*s.* given by various Societies and Ipswich Local Committee—per contra)				12,371	13	0
COST OF FORAGE FOR LIVE STOCK				1,102	7	6
JUDGES' (STOCK AND IMPLEMENTS) FEES AND EXPENSES				591	5	4
GENERAL ADMINISTRATION :—						
Honorary Director :—Travelling, Entertaining, etc.	196	18	9			
Stewards and Assistants :—*Stock, Hospitality and Implements* :—Personal and Railway Expenses	336	1	10			
Secretary and Staff :—Travelling, Maintenance, etc.	662	8	2			
Carried forward	£1,195	8	9	£34,581	18	11

Receipts (*contd.*).

	£	s.	d.	£	s.	d.
Brought forward				45,435	8	7
MISCELLANEOUS RECEIPTS :—						
Admissions to Flower Show	1,504	17	0			
Motor Parks	2,107	9	0			
Rent for Railway Offices	111	0	0			
Premiums for Catering and Cloak Rooms .. .	555	0	0			
Rent for Ministry of Agriculture Pavilion ..	170	0	0			
Advertisements in Stock Prize Sheet .. .	210	1	3			
Sales of Produce at Dairy	181	1	9			
Derby Show :—outstanding items	3	9	0			
Sundry Receipts	52	1	0			
				4,894	19	0
				£50,330	7	7

Examined, audited, and found correct this 23rd day of November, 1934.

T. B. Turner,
Secretary.

Price, Waterhouse & Co.,
Chartered Accountants.

Expenditure (*contd.*).

	£	s.	d.	£	s.	d.
Brought forward	1,195	8	9	34,581	18	11
GENERAL ADMINISTRATION (*continued*) :—						
General Management :—Finance Stewards, Grand Stand Men, Turnstile Men, Bank Staff, £209 10*s*. 5*d*.; Catalogue Sellers, £76 13*s*. 7*d*.; Foremen and Yardmen, £208 18*s*. 6*d*.; Gate-keepers, £108 3*s*. 11*d*.; Commissionaires, £26 11*s*. 4*d*.	629	17	9			
Veterinary Department :—Inspectors	132	4	9			
Engineering Department :—Consulting Engineer	162	8	0			
Police	486	0	0			
				2,605	19	3
GENERAL SHOWYARD AND MISCELLANEOUS EXPENSES :—						
Dairy :—Building, £445 16*s*.; Steward, Assistants and Staff, £314 0*s*. 5*d*.; Milk, £269 2*s*. 11*d*.; Utensils, £68 13*s*. 11*d*.; Engine and Engineers, £112 17*s*. 4*d*.; Miscellaneous, £90 9*s*. 5*d*.	1,301	0	0			
Poultry and Produce :—Buildings, £372 4*s*. 4*d*.; Miscellaneous, £194 6*s*. 11*d*.	566	11	3			
Flower Show :—Hire of Tents, etc., £438 2*s*.; Miscellaneous, £265 19*s*. 3*d*.	704	1	3			
Motor Parks :—Tents, Offices, etc.	81	15	0			
Plantations and Orchards Competitions	138	11	2			
Forestry :—Tent and Miscellaneous	234	15	1			
Military Display	453	9	1			
Band	216	0	0			
Hire of Furniture	262	15	1			
Royal and Official Luncheons	121	2	5			
St. John Ambulance	80	10	8			
Insurance	93	11	6			
Medals and Expenses *re* Cups	70	3	6			
Badges and Rosettes	112	13	10			
New Implements :—Testing and Medals	60	5	9			
Derby Show :—outstanding items	66	19	5			
Sundry expenses	349	10	9			
				4,913	15	9
				42,101	13	11
.... Credit balance				8,228	13	8
				£50,330	7	7

Proceedings at General Meeting of Governors and Members

HELD IN THE LARGE TENT IN THE IPSWICH SHOWYARD.

THURSDAY, JULY 5th, 1934,

THE EARL OF STRADBROKE, K.C.M.G. (PRESIDENT), IN THE CHAIR.

The PRESIDENT said he certainly felt it a great honour to have the pleasure of presiding there. He thought they all felt it to be a unique occasion, being the first time on which "the Royal" had honoured Ipswich by paying it a visit.

There might be one or two present who, like himself, were on the deputation from Ipswich which offered the Society an invitation in 1907, when they were not successful. But, when an invitation was accepted last year they in Suffolk made up their minds at once that nothing should be left undone to ensure the success of the Show—(applause). They put their backs into it and they were most generously supported by everybody. They intended the welcome to be a really hearty one.

It was true that "the Royal" visited Suffolk in 1867, but for several reasons it was not a very big Show in those days. East Anglia had been honoured pretty well since that time. Cambridge had been visited on three occasions, Norwich on three occasions, Lincoln twice, and Chelmsford once. So it could not be said that East Anglia had been left in the cold.

When it was first mentioned that "the Royal" was coming to Ipswich there were a great many discussions. Difficulties were raised: it was said that they could not find a site and that the necessary finances would not be forthcoming. "Well," said the PRESIDENT, "Suffolk people are like Suffolk punches; when they put their shoulders into the collar, something has got to move." (Applause.)

Difficulties were swept away; and he thought all would agree that the show-ground was a very suitable one—the site was compact, and visitors were able to inspect the exhibits without having to walk great distances.

The finances had been forthcoming in a way they had hardly dared to anticipate, and he was very glad to say that they had received most hearty and generous support not only from Suffolk, but also from the neighbouring counties of Norfolk and Essex.

It was naturally thought with "the Royal" at Ipswich that Suffolk would agree to abandon their own county show for the year; but it was an exceedingly kind action on the part of Norfolk and Essex to do the same, and he sincerely trusted that the three county organisations would not suffer, but rather that such a fillip would be given them that week that they would increase their membership in the coming years. (Applause.)

The Council of the Royal Agricultural Society were very much heartened in March when they heard of the enormous applications for space by Implement and Machinery manufacturers and that the showground had had to be reorganised to take them all in. Then in May they had the satisfactory intelligence that the live stock entries were far above expectations and greater than for some years.

It was only to be anticipated that the three East Anglian breeds would be in the forefront, and he thought owners had sent exhibits which had given a great deal of satisfaction not only to those interested in those breeds, but to everyone interested in Agriculture. (Applause.)

At the same time, they in East Anglia were grateful to breeders of other stock who had come forward and sent such large entries to Ipswich, in some cases from long distances. The entries all round were most satisfactory.

In drawing comparisons, it was interesting to recall that at Bury St. Edmunds in 1867 the classification for horses mentioned only four breeds, for sheep seven breeds, and for pigs four breeds; whereas at the Show to-day there were in the schedule 10 different breeds of horses, 22 breeds of sheep, 11 breeds of pigs, and they must not forget the 23 breeds of cattle. There were no cattle in 1867. In the previous year the country was ravaged by cattle plague; therefore it was not desirable to have cattle at the 1867 show.

Another curious coincidence was that in the Bury year there was a marked increase in the applications for space for agricultural machinery, more especially machinery for steam cultivation which just at that time was coming to the forefront. At Ipswich this year there had also been a large increase in the exhibits of machinery.

It all showed that East Anglia, besides being successful in cultivating breeds of live stock, also went in for machinery, and he thought manufacturers might look forward to improved trade in that direction.

Whatever the financial results might be, everyone would agree that the very best thanks were due to the Local Committee for the way in which they had organised the publicity and advertised the Show. (Applause.) It was not possible to remember all who took a prominent part, but naturally they owed great thanks to his old friend, Mr. P. W. Cobbold, the Mayor of Ipswich, and to the Town Clerk, Mr. Moffat, for the part they took, and also to Mr. C. H. Clarke for his services in connection with the live stock department, to Mr. S. C. Grimwade and many others.

They must not forget that the ball was set rolling by the Deputy-Mayor, Mr. R. F. Jackson, at the meeting held some 12 months ago. And all their efforts would not have been much good had they not had an excellent Honorary Director and staff. Everything had passed off without a single hitch of any sort, and they were deeply grateful to Mr. Burke and those who worked with him so ably.

His Lordship then made reference to the honour of the Royal visit, and satisfaction at the interest H.R.H. the Prince of Wales had taken in the exhibits. As a farmer himself, with experience at home and abroad, the Prince knew what live stock should be, and the importance of machinery. It was a kindly act on His Royal Highness's part to take a drive through the town, to which he had at once readily agreed, when he heard that his route had been altered because of other arrangements. It showed his appreciation of what had been done by the people.

Sometimes, said his Lordship, it was considered necessary for the President to express his opinions as to the future and general outlook of agriculture.

"I think we may say there is a more hopeful outlook for agriculture. You may ask me why. I cannot tell you why; but it is so. Perhaps it is because for some of our produce there is more or less a promise of stability of prices. If only we could know that, we could make our arrangements ahead and work accordingly."

Alluding to the visit of Mr. Elliot, the Minister of Agriculture, which was welcomed, the President referred to the difficulties of his task, finding what suited one side as well as what suited the other, and considering the interests of the whole. The exhibits by the Ministry of Agriculture were very useful and instructive. The Milk Marketing Board's exhibit showed that the poor man could do without much expenditure to ensure the production of pure milk.

The tent arranged by the Education Committees of the County Councils also contained instructive exhibits. Such displays made them realise that the more they knew about a thing the more there was to learn.

In conclusion, his Lordship desired to say how very much he appreciated the honour of having the pleasure of presiding over them at a show started most successfully, with attendances surpassing what they had dared to hope. Everything was going satisfactorily—at any rate, that was the opinion he had formed on going through the grounds and seeing the happy expressions on the faces of all who had come to the show. (Applause.)

Thanks to Mayor and Corporation and Local Committee.

Mr. U. ROLAND BURKE (Honorary Director) proposed, "that the best thanks of the Society are due and hereby tendered to the Mayor and Corporation of Ipswich and the Local Committee for their cordial reception of the Society and their efforts to promote the success of the show."

He need hardly say how gratified he was to do so after working so long as he had in conjunction with the Mayor and his Committee, and he most heartily

endorsed all Lord Stradbroke had said. That Committee had had one of the best Secretaries possible in Mr. Moffat, of whom he could not speak too highly as to what he had done in local organisation.

And he (Mr. Burke) thoroughly endorsed all the President had said with regard to what Mr. Clarke had done on the publicity side. The excellent "gate" the previous day, and what looked like being another, was largely due to the work of the Publicity Committee at Ipswich.

He wished also to associate himself with the remarks as to the three societies—Royal Norfolk, Suffolk and Essex. Deciding not to go on with their own shows, they had given a handsome contribution that started the enormous interest which had been taken in the three counties, as apart from Ipswich itself. They were very grateful to Mr. Kerridge, Mr. L. Haywood Smith and Mr. J. B. Gill.

The Mayor of Ipswich had been a tower of strength to the whole promotion of the show at Ipswich. (Applause.) A good many of those present had known Mr. Cobbold, if only by name, as one of the best slow bowlers in England, and it was not unlikely that he might be sent for that afternoon to go to Manchester. (Laughter and applause.) Mr. Burke said he had recently been staying with Mr. Cobbold, when he had seen what that gentleman described as his swan song—a memento of an occasion when he had ousted the good Harrovians for 20 runs. He (Mr. Burke) hoped that Mr. Cobbold would put his show badge with his other trophies and call it "The success of the Royal at Ipswich." (Applause.)

Lt.-Col. E. W. Stanyforth, in seconding the resolution, said he did not think he had ever known more sympathetic interest taken by the town visited than that shown by Ipswich—(applause)—not only sympathy, but interest in the Society's work. From the very first there was no doubt that Ipswich and East Anglia had done more, he thought, than any place, and they were deeply grateful.

The resolution was carried with applause.

The Mayor of Ipswich, who was received with applause, said he really felt it a great honour to stand up and reply to that vote of thanks. He did feel that the vote was very well deserved, not by him but by the whole of East Anglia. Before he added more, he wished to go a little further back than the President when he quite properly referred to the Deputy-Mayor as having taken great interest during his year. He was anxious not to omit two other names, those of Mr. Clouting, who was Mayor at the time the idea first originated, and went round inspecting various unsatisfactory sites and taking a great interest, and that of his successor, Mr. G. W. Senton. Mr. Jackson continued the contribution, whereas he (the Mayor) had only had to sit still and reap the reward of their efforts. When the Local Committee was instituted, it was faced with two particular problems, one finance and the other the best method of getting publicity, and he must add that the idea of raising £10,000 in this poor district of England filled him with a certain amount of alarm. That alarm was entirely unnecessary, because from the start everyone in East Anglia at once looked to the show as their own show, and were determined to make it a success if they possibly could. They contributed, not only in work but in cash, and the result, as they all knew, was that, thanks to the efforts of the whole of East Anglia, they had managed to raise a sum of over £11,000. (Applause.)

Publicity was a far more difficult question, but he was glad to know that what they had done met with the approval of the members of the Society, and as far as could be judged the approval of the general public, who were flocking to the show. The work of Mr. C. H. Clarke had been alluded to, but he (the Mayor) would not sit down without saying his little word of thanks to Mr. Clarke and the local Press. (Applause.)

They had done everything they possibly could to make the show a success, and he did not think there was a prouder man in the show than Mr. Clarke. Mr. Gill, Mr .Kerridge, and everyone to whom they appealed played their part in their counties. He mentioned that because he was standing to return thanks, not only

for Ipswich, but for Suffolk, Essex and Cambridgeshire, the whole of East Anglia. It was a heavy load on a pair of old shoulders.

Mr. Burke had been kind enough to refer to his cricketing exploits, and his dismissing the Harrovians for 20 runs. The truth was he got six for eight in the second innings. That was on the second day of the match, and was possibly due to the fact that while he himself had been comparatively abstemious the night before, their Harrow opponents had dined without due discretion. (Laughter.)

The most amazing part of that amazing show was the number of people who had paid to come in. To get so near to the Harrogate record on the second day in this part of the country was matter for wonderment. To have 16,000 paying before eleven that day was a marvellous performance. Frankly, he was amazed at the "gates," for whilst he knew the show would be a success, he did fear they would fall below other parts of the country.

"Wherever they have come from, here they are, and it looks as if, at any rate, the show could not be a failure." (Applause.) Naturally they were proud of it coming to Ipswich, and he was proud to think that they had shown their appreciation of the honour, by doing their little bit. (Applause.)

They were determined to give a royal welcome to the Royal Show. Although he supposed he could not anticipate another visit during his lifetime, and that must be his swan song to "the Royal" at Ipswich, when the time did come and the Society honoured Ipswich with another visit, he felt sure they would make it with a confidence the like of which they were not imbued with four years ago. Their experience of Ipswich would have shown that they could rely on Ipswich and East Anglia to do its part. (Applause.)

Railway Staff Thanked.

Lord Eltisley, in moving a resolution, "That the best thanks of the Society be given to the staffs of the L.N.E.R. for all they had done in handling so expeditiously the traffic of the show," quoted some interesting figures to illustrate the magnitude of the task.

The Company, in order to deal with the show traffic, had built a special station, constructed 11 rail sidings, with four platforms, and one road with cart access for 20 wagons. End-on dock accommodation was provided on four roads. The inwards goods traffic dealt with was 1,623 tons, loaded in 827 wagons, in addition to which there were 1,787 tons of the Society's show plant and timber. The livestock dealt with included 349 horses, 478 cattle, 339 sheep, 205 pigs, and 320 hampers of poultry. In the delivery of goods and livestock 26 tractors, 12 mechanical horses, 10 motors, 15 mechanical horse trailers, 16 tractor floats, and 11 mechanical horse-floats were used. All the cartage had been done by vehicles fitted with rubber tyres, and it was probably due to this that the showground was in such good condition and not cut up. The work in connection with the show had been under the personal supervision of the District Goods and Passenger Manager, Mr. P. S. Ludlam, of Ipswich, and the District Superintendent, Mr. E. F. Greenfield, of Norwich. To them and their staffs the Society wished to convey their thanks.

Mr. Fred Smith, as one of the oldest members of the Council, had much pleasure in seconding the resolution. He was sure that all connected with the Railway Company had made great efforts to see that the show was a success.

From no distant date they had seen the show grow into what was one of the biggest for many years. The Railway had spent vast sums of money to make the show a success, and they trusted that as Ipswich grew the Company would be repaid for some of their outlay.

It was quite true that a gathering of that sort was not so dependent on railways as in the past. It was quite true, too, that the railway companies were more disposed to listen to their requirements than formerly.

He was sorry Mr. Evens, the Chairman of the Stock Prizes Committee of the Council, was unwell and unable to be with them that day. Recently it seemed

expedient that a deputation should go before the Railway Clearing House. Mr. Evens had then put before the railway authorities some proposals which he was sorry had not been favourably received. If adopted, they would have been for the benefit of exhibitors and also, he believed, for the benefit of the railway companies in these days of keen competition.

The resolution was put to the meeting and carried unanimously.

The President then enquired if any Governor or Member had any remarks to make or suggestions to offer for the consideration of the Council.

No Governor or Member rose in response to this invitation.

Thanks to President.

Mr. R. S. Walters (Birmingham) said he was confident that at a meeting of that character all present would wish to pass a vote of thanks to their President not only for the kindly address he had given them that day but also for his conduct of the business of the Society.

Personally, he felt, coming as he did from some distance, that many Britishers knew much less of East Anglia than they ought to know. He had been particularly struck by East Anglian methods. Apparently every village within 30 miles knew all about the Show and the main roads to Ipswich were thronged by the whole of the villagers waiting for transport. He congratulated the President on being an East Anglian. Much had been heard of the depression in those parts, but he did not think they could believe all they read. He had seen crops of corn in East Anglia the like of which he had not seen in other parts and he had inspected crops of roots which he could hardly believe even when he looked at them. Everything looked prosperous. He could almost visualise the time when prosperous East Anglians would be asked to subsidise the unfortunate district from which he came. (Laughter.)

He had great pleasure in proposing a vote of thanks to Lord Stradbroke.

Mr. J. Watt (Carlisle) said it was an honour and a pleasure to second the resolution so happily proposed by Mr. Walters. Their noble President had, he thought, established a record for that Show. Not merely a numerical record but a record in the attendance of those who lived by the soil and worked on it and were interested in farming. With no large industrial city to draw upon he took it as a personal compliment to their President.

He could not agree with the proposer that his part of the country should draw a subsidy from Suffolk. He thought, however, that Mr. Walters might live in hopes of receiving something from the Exchequer as he had been told that feeders might look forward to some assistance to make up for what they had lost in the past. He only hoped the statement was well founded.

The resolution of thanks to Lord Stradbroke was carried with acclamation.

The President said he was very grateful for the resolution so kindly proposed and seconded. They in East Anglia were delighted that visitors would carry away with them such happy recollections. They tried to put a smiling face on everything and to give a good welcome.

Reference had already been made to the Honorary Director and the Staff. He was very grateful also to the Secretary for the way he had kept him up to the mark. Had it not been for Mr. Turner's assistance he would have made many more mistakes than he had done.

Once again he thanked them for their support in connexion with the Show, which he hoped would continue to be the success it had started to be.

Proceedings at the Annual General Meeting of Governors and Members

HELD AT THE ROYAL AGRICULTURAL HALL, ISLINGTON, LONDON, N.,

WEDNESDAY, DECEMBER 12th, 1934.

THE EARL OF STRADBROKE, K.C.M.G. (PRESIDENT), IN THE CHAIR.

The PRESIDENT, who was greeted with applause, said: My Lord Duke, My Lords, Ladies and Gentlemen, You will forgive me, I think, if I say that I feel very proud at having had the honour of being your President during the last twelve months, when so much success has attended our Society. ("Hear, hear.") When I accepted the position last year in which you were kind enough to place me, I said I felt rather shy about it and that I had great diffidence in following so successful a President as the Duke of Devonshire, who had just shepherded the Society through a very successful year, but I trust that the great traditions set by so many eminent people in the past with regard to this Society have not suffered during the last twelve months. Everything in connection with the Society has worked smoothly and well, but, if that has been the case, I think you all realise that it has been due to the splendid work done by the Committees, who have the greater part of the work to do, and to the excellent work done by Mr. Roland Burke and his staff, as well as by Mr. Turner and his staff in the office work department.

I should remind you, perhaps, that we are meeting here today in this room by the kindness and hospitality of the Smithfield Club and that the members are admitted here by the generosity of the Royal Agricultural Hall Company. I am sure that you would like me, on your behalf, to thank them very much indeed for all the arrangements that they have made for us and for receiving us here to-day. ("Hear, hear" and applause.)

With regard to the Report, I believe you all have it in your hands and I hope that you have read it through. In that case it will not be necessary for me to go into detail with regard to the work that has been done during the last twelve months, but there are one or two points to which I ought to draw your attention.

First of all, I must point out to you that there has been a great falling off in the number of our members during the last eight years. You will see by the Report that we have now only 9,243 members as against 13,620 in the year 1925. That is a drop of something like 4,400 members, and you will realise that it means a loss to the Society of something like £4,400 a year. I do hope that all of you will do what you can to obtain new members of the Society. We are told that agriculture is looking up. The Government is doing what it can to help us, and we must put our personal work into this matter in order to induce new members to join our Society. I hope that everybody here will make a point of doing that. It is really a most important matter.

With regard to the Show that was held at Ipswich last summer, so much has been written and said about it that I feel some diffidence in adding anything more, but it is satisfactory to know that all that has been written and said about it has been in praise of the way in which the Show was conducted and of all the arrangements that were made for it. Perhaps I can speak in a dual capacity here, both as your President and as an East Anglian. As your President, I think we must be satisfied with the way in which everything connected with the Society was prepared. Mr. Burke, on his side, did everything possible to make it attractive and all the arrangements worked smoothly, and Mr. Turner and his staff had everything in connection with the office well in hand and carried through satisfactorily also. ("Hear, hear.")

With regard to the Local Committee, I think we cannot speak too highly of the way in which they entered into the work that they had to do. They started an advertising scheme showing what was going to take place, and they carried it through with the greatest spirit. We were most fortunate in having very active

support from the neighbouring counties of Norfolk, Essex and Cambridgeshire. Thanks to their efforts, subscriptions came in very generously, and I think we must also thank them for the large attendance at the Show. ("Hear, hear" and applause.) They, on their part, were very pleased with what was said with regard to our efforts and also were very greatly delighted at the success of the Show, so much so that they will be very glad to offer a welcome and a reception to this Society in a few years to come if the Society is pleased to go there again. ("Hear, hear.")

The response to the appeal for subscriptions to the local fund was so good that the Local Committee were able to hand back the £500 that had been promised by the Suffolk Agricultural Society, Norfolk Agricultural Society and by the Essex Agricultural Society, and, in addition to that, they had £1,500 in hand, which they handed over to the Royal Agricultural Benevolent Fund. ("Hear, hear" and applause.)

Next year we are going to hold the Show at Newcastle, and the work in connection with that Show is well in hand. It will not be the first time, by any means, that we have been to Newcastle, and the Society has always received the most hospitable and generous welcome on going up north. Unfortunately, as we know, evil times have fallen on Newcastle since our last visit, but we can rely on its people to do their very best. We trust that trade will have improved by next year. Certainly the Newcastle people will leave no stone unturned to make the Show a success, such as it has been in previous years. The Council, on their part, are recommending various attractions which we hope will draw a good attendance. Of course, these attractions involve a good deal of expense, and we hope to get some of that back in the way of gate money. We cannot stand still and things must go on, and we must risk a certain amount of money to ensure the success of the Show.

As far as the north is concerned, the County Agricultural Shows of Northumberland and Durham will be suspended in order that the Agricultural Societies of those counties may be able to help the Royal Society. We can be sure that the Breed Societies of the north will be as active and energetic as the Breed Societies in East Anglia were this year and that they will take care that first class exhibits, in good numbers, are sent to the various classes. As you will see from the Report, there is a most comprehensive prize list, which should prove most attractive. This year one of the attractions at the Ipswich Show was the teams of horses, and we hope that that will be an attraction again next year at Newcastle. It is a long way for some of the teams to go, but assistance will be given to them. We all feel, I think, that that added a very useful class to our exhibits at the Ipswich Show. ("Hear, hear" and applause.)

We must not think that the Show is the only thing for which this Society works. It has been called the shop window of the Society and the stock-breeders, but the Society does a great deal more than arrange for the Royal Show. Those who go into the details of its work know that the Veterinary and Research Committees are always at work, and have been so for years past, in trying to find out by experiments how to check animal diseases and how to prevent them. Many experiments are also made with regard to crops and plant growth. All this is very valuable work and it is most useful and instructive to farmers and others who take the trouble to read these Reports. We also carry out experiments as to the benefit of electricity in cultivation and in the work of farms, and I have been told that certainly in the horticulture department electricity has proved already of great benefit to market gardeners. Also, with regard to estate work and forestry, a good deal is done to explain how the methods adopted can be improved, and competitions are encouraged.

I am sure that a perusal of the Report will be of very great benefit and interest to all concerned in agriculture and matters connected with estate and forestry management, and I hope that the members of the Society will not only read it but pass it on to their friends, so that they will be interested and perhaps join the Society in consequence.

In a few minutes you will be told about the President for next year. I am sure you will all be delighted to know that the Duke of Kent has been nominated as President of the Society for next year. Under his Presidency we may look forward to a most successful year's work in 1935. ("Hear, hear" and applause.)

Presentation of Balance Sheet.

The PRESIDENT: The next matter on the agenda is the presentation of the Balance Sheet. The Balance Sheet for 1933 and the Accounts for the Ipswich Show are in the hands of all present, I believe. There is no comment to be made on them, I suppose?

Report of the Council.

The PRESIDENT: The Report of the Council has been printed and circulated through the post to each member of the Society. Do you agree that it should be taken as read? (Agreed.)

MR. J. A. FROST: My Lord President, My Lords, Ladies and Gentlemen, although I am not an East Anglian farmer I have the greatest pleasure in moving the adoption of this Report. It is, I think, highly satisfactory. The East Anglians gave a very successful Show; it was one of the best I have ever seen, and I think I have attended almost every one since 1889. The show of East Anglian breeds—Suffolk horses, Red Poll cattle and Suffolk sheep—was really marvellous, and contributed greatly to making the Show a success. The attendance was good and the profits of the Show were amongst the best we have had. I am sure Mr. Burke and his colleagues are to be congratulated on the work they did in helping to arrange such a good Show. I am very pleased that such a large sum of money was handed over to the Royal Agricultural Benevolent Institution, which is in need of money.

The loss of membership suffered by the Society is regrettable, but it is due to the hard times through which farmers have been passing, and I hope that better times are in store.

If the Ipswich Show can be matched by the Show at Newcastle next year, the success of the Royal Agricultural Society is assured.

MR. J. THOMAS: My Lord President, My Lords, Ladies and Gentlemen, I have the greatest pleasure in seconding the motion for the adoption of the Report. I should like to endorse all that Mr. Frost has said with regard to the Royal Show at Ipswich. I was there from Monday evening until Friday, so I speak with first hand knowledge when I say that it was a really excellent Show.

I should like to say that I am still proud, as a British farmer, that so many of the old aristocracy of England uphold an institution which is really doing good work for agriculture. I do not know what we should have done without them in the past. I very often say to my friends who dwell in the towns: "You do not know your indebtedness to the old aristocratic families of England. They have been the backbone of agriculture right through." ("Hear, hear.") I have farmed under two or three lords. I regret to say that the estates have now been sold. My father farmed under an aristocratic family, and we thought he was as well off as if he was his own landlord, but the estate of that family was also sold. The same was the case with my grandfather before that. I think we should remember that we are indebted to the aristocracy of England for helping us, the poor farmers, to exist. To-day when estates are sold we are almost at the door of the workhouse

The PRESIDENT: It has been moved and seconded that the Report be adopted, and I now put the resolution to the Meeting.

The resolution was carried unanimously.

Amendment of Bye-law No. 154.

The PRESIDENT: I now have to move the following resolution:—

"That Bye-law No. 154, enacted under the provisions of the Supplemental Charter dated the First day of April, 1905, be amended as follows:—

"In the second line of such Bye-law, after the words 'Council Meetings,' the words '*(for which purpose attendance at two meetings of the same Committee shall be regarded as equivalent to attendance at one Council Meeting)*' be inserted within brackets;

and it is resolved that the above amendment be and it is hereby enacted with the sanction of the Governors and Members present at this General Meeting, and that such amended Bye-law be printed, together with the other Bye-laws and Charters of the Society."

The object of this amendment is that attendance at two Committee meetings shall equal attendance at one Council meeting. As you know, most of the work is done at the Committee meetings, and I think you will therefore agree to this alteration of the Bye-law. I will ask Mr. Burke to second the motion.

Mr. BURKE: My Lord, I have much pleasure in seconding the motion.

The resolution was put to the meeting and carried by a show of hands.

Election of President.

The PRESIDENT: The next matter on the agenda is the election of the President. As I have already intimated to you, the Council approached His Royal Highness the Duke of Kent, with a view to his accepting the position of President of the Society, and I am glad to say that we have received the following letter:—

ST. JAMES'S PALACE,
S.W.
15th November, 1934.

DEAR LORD STRADBROKE,

I write to convey His Royal Highness's sincere regrets that he will be unavoidably prevented from being present at the Annual General Meeting of the Royal Agricultural Society on Wednesday, December 12th.

His Royal Highness would be extremely grateful if you would convey these regrets to the Members of the Society, and I am to add that His Royal Highness is much looking forward to attending the Show next July.

Yours sincerely,

(Signed) ULICK ALEXANDER.

COL. THE EARL OF STRADBROKE, K.C.M.G., C.B.

I am sure you will wish to elect His Royal Highness as our President. In accepting that position, he will only be following the example set by other members of the Royal Family. Her Majesty Queen Victoria, His Majesty King Edward VII and His Majesty King George have all filled the position of President of the Society, as have also Their Royal Highnesses the Prince of Wales, the Duke of York and the Duke of Gloucester. We have always looked for and have always received the most generous and whole-hearted support from our King and Queen and members of the Royal Family, and we are delighted that the Duke of Kent is good enough to follow their example and accept the position of President.

I beg to move that His Royal Highness the Duke of Kent, K.G., be elected as President of the Society for the ensuing year, and I will ask the Duke of Devonshire to be kind enough to second that resolution.

The DUKE OF DEVONSHIRE, who was received with applause on rising to speak, said: My Lord President, My Lords, Ladies and Gentlemen, I regard it as a very high privilege that I have been asked to second this very important resolution. The fact may not be generally realised, but I think that all the members of the Council and the members of the Society as a whole will very shortly realise, if they have not done so already, that within a year or two we shall have to

consider the most suitable means of celebrating the one hundredth anniversary of the formation of the Royal Agricultural Society of England. It is not for me at the present moment to attempt to forecast what would be the most suitable way of adequately celebrating that great event. Any Society which can look back upon one hundred years of unbroken success must be in a proud position. During that long period the Royal Agricultural Society of England has enjoyed many privileges and many advantages, but certainly amongst those privileges and advantages I should place in the foremost rank, without any hesitation, the fact that we have always had, during the whole of that period, the continual support of the reigning Sovereign and the members of the Royal Family. (" Hear, hear " and applause.)

You, my Lord, reminded us of the fact that Queen Victoria, King Edward, His present Majesty, the Prince of Wales, the Duke of York and the Duke of Gloucester have all taken an active part in the work of this Society. In fact, not only have they done their best to support the Society but they have been, and I hope will continue to be, highly successful exhibitors at our various Shows. (" Hear, hear.") I have not yet had the opportunity of seeing the Show now being held in the Hall here, but I believe that both His Majesty and the Prince of Wales are successful exhibitors there. (" Hear, hear.")

We all look back with the greatest satisfaction at the wonderful welcome which His Royal Highess the Duke of Kent and Her Royal Highness the Duchess of Kent received at their wedding a fortnight ago. It was a spontaneous tribute not only to His Royal Highness's own popularity but to the great esteem in which every member of his family is held throughout the length and breadth of the country.

I am sure that under His Royal Highness the Society can look forward with every confidence to a year of satisfactory progress. It was my privilege in 1908, when the Show was held at Newcastle-on-Tyne, to be President for the year, and I have most happy recollections of the very generous, cordial and warm-hearted welcome which we received on that occasion, and the great efforts that were made by everyone in the city and in the county to make the Show a success. I am quite certain the news will be received there with the greatest satisfaction that His Royal Highness has consented to be President of the Society and has intimated his intention of visiting the Show, if possible, when it is held at Newcastle next July. I think we can look forward to giving His Royal Highness a very cordial and hearty welcome there, and I am quite confident that, amidst the many great successes which the Society has achieved in the past, its year under his rule and under his presidency will be a very happy one. I am sure that we shall all do our best not only to make the work easy for His Royal Highness but to make his year of office a very happy and a very pleasant one for him.

I have very great pleasure, my Lord, in seconding the resolution which you have proposed from the Chair. (*Applause.*)

The resolution was put to the meeting by the President and carried unanimously.

Election of Trustees.

The President: The next business on the agenda is the election of the Trustees. The Trustees are elected, according to custom, by a show of hands. The names of the present Trustees, who are, under Bye-law 141, recommended by the Council for re-election, are printed in List " A " on the agenda paper, and I will now ask you to signify in the usual manner whether it is your pleasure that these twelve noblemen and gentlemen should be elected Trustees of the Society to hold office until the next ensuing Annual General Meeting.

The Trustees, whose names are as follows, were duly elected :—

H.R.H. The Prince of Wales, K.G., York House, S.W.1.
H.R.H. The Duke of York, K.G., 145, Piccadilly, W.1.
H.R.H. The Duke of Gloucester, K.G., Buckingham Palace, S.W.1.
Charles Adeane, C.B., Babraham Hall, Cambridge.
The Duke of Bedford, K.G., Woburn Abbey, Bedfordshire.
Lord Cornwallis, Linton Park, Maidstone, Kent.
Percy Crutchley, Sunninghill Lodge, Ascot, Berkshire.
Lord Daresbury, C.V.O., Walton Hall, Warrington.
The Duke of Devonshire, K.G., Chatsworth, Bakewell, Derbyshire.
Lord Harlech, C.B., Brogyntyn, Oswestry, Shropshire.
Sir Arthur Hazlerigg, Bart., Noseley Hall, Leicestershire.
Lt.-Col. E. W. Stanyforth, C.B., Kirk Hammerton Hall, York.

Election of Vice-Presidents.

The President: Now we come to the election of the Vice-Presidents, and I will ask you again to signify by a show of hands whether it is your pleasure that the present Vice-Presidents, whose names are printed in List "B," should be re-elected to hold office until the next ensuring Annual General Meeting.

The Vice-Presidents were duly elected, as follows :—

The Rev. C. H. Brocklebank, Westwood Park, West Bergholt, Essex.
Sir Merrik R. Burrell, Bart., Floodgates, West Grinstead, Horsham.
The Earl of Derby, K.G., Knowsley, Prescot, Lancashire.
Lord Desborough, K.G., Taplow Court, Maidenhead.
R. M. Greaves, Wern, Portmadoc, North Wales.
The Earl of Harewood, K.G., Harewood House, Leeds.
William Harrison, Albion Iron Works, Leigh, Lancashire.
Lord Mildmay of Flete, Flete, Ermington S.O., Devon.
The Duke of Portland, K.G., Welbeck Abbey, Worksop, Notts.
The Earl of Powis, Powis Castle, Welshpool, Mont.
The Earl of Stradbroke, K.C.M.G., Henham Hall, Wangford, Beccles, Suffolk.
The Earl of Yarborough, K.G., Brocklesby Park, Habrough, Lincolnshire.

Election of Professional Accountants and Auditors.

The President: The next item on the agenda is the election of the Auditors. I call on Mr. Gooch to move a resolution.

Mr. F. L. Gooch: My Lord Duke, My Lords, Ladies and Gentlemen, I have great pleasure in moving that Messrs. Price, Waterhouse & Company be elected as Professional Accountants and Auditors of the Society's accounts for the ensuing year. I hope they will always have the balance on the right side!

Mr. James Hamilton: My Lord, I have much pleasure in seconding that proposition.

The resolution was carried unanimously.

Elections to the Council.

The President: With regard to the election of Members of the Council, under the Bye-laws the requisite measures have been taken to fill the vacancies on the Council in the representation of the Districts in Group "B." As Chairman, I have now formally to report to the Annual General Meeting the names and addresses of the Ordinary Members of the Council who have been elected by the several Divisions, in order that the meeting may, in the words of the Bye-law, "take cognizance of their election." I perform this duty by placing before you List "C," on pages 3 and 4 of the printed agenda paper, in which the names of the newly elected members are specially marked.

Durham: William Burkitt, Grange Hill, Bishop Auckland.
Yorks (West Riding): C. W. H. Glossop, M.P., Bramwith Hall, near Doncaster.
Nottingham: Thomas Forshaw, The Stud, Carlton-on-Trent, Newark.
Leicester: W. Lindsay Everard, M.P., Ratcliffe Hall, Leicester.
Rutland: E. Guy Fenwick, North Luffenham Hall, Stamford.
Suffolk: Major Norman Everett, Rushmere, Ipswich; Fred Smith, Deben Haugh, Woodbridge.

Buckingham: B. J. Gates, Pembury, Tring.
Essex: Sir Walter Gilbey, Bart., Elsenham Hall, Elsenham.
London: John Bell, The Hall, Thirsk, Yorks; Lt.-Col. Sir Archibald G. Weigall, K.C.M.G., Englemere House, Ascot, Berks.
Shropshire: E. Craig Tanner, Eyton-on-Severn, Wroxeter.
Hereford: William Smith, The Leen, Pembridge, Leominster.
South Wales: Capt. Hugh A. Christy, Llangoed, Llyswen, Breconshire.
Devon: Sir John F. Shelley, Bart., Shobrooke Park, Crediton.
Wiltshire: The Earl of Radnor, Longford Castle, Salisbury.
Surrey: R. Borlase Matthews, Greater Felcourt, East Grinstead.

Members' Suggestions.

The PRESIDENT: I have now to ask if any of you have any remarks to make or suggestions to offer that may be referred to the Council for their consideration.

COLONEL REES-MOGG: I have a suggestion that I should like to make. At the Royal Shows people have had the habit of taking luncheon baskets into the grand-stand. You see great luncheon baskets all over the place. They are not sandwiches, which do not take up room, but people bring huge baskets almost as big as clothes baskets. Owing to the crowds, it is impossible for the people to get rid of their luncheon baskets and in consequence they take up an enormous lot of space in the stand. The stand is always overcrowded. People cannot get in, and at the Show at Ipswich this year it was especially bad. People were standing at the bottom, and these huge luncheon baskets were occupying most valuable seating accommodation in the stand.

The PRESIDENT: Thank you.

Mr. C. H. CLARKE: May I be allowed to offer a suggestion to the Council? I have spent a good deal of time in the offices of the Society this year—it has been both pleasant and instructive—in diving into every one of the Journals of the Society from its beginning. They contain an exhaustive review of agricultural conditions from year to year and also very fine descriptive accounts of the Shows. May I ask if it is possible to try to model the present Journals on those of the past? There are many articles there by practical men whose names stood foremost in the industry in those days.

There is another matter which I should like to suggest should be taken into your serious consideration. Remarks were made to me at our last Show that, good as it was, it had one defect, namely, the absence of the Farm Competitions.

The PRESIDENT: Are there any other suggestions to be made?

The two suggestions which have been made will be referred to the Committees that deal with the subjects in question and they will receive careful consideration. We are much obliged to Colonel Rees-Mogg and Mr. Clarke for making the suggestions.

Vote of Thanks to Retiring President.

Mr. C. ADEANE: My Lords, Ladies and Gentlemen, a year ago I had the very great pleasure of proposing Lord Stradbroke as President of the Society, and I ventured on that occasion to make a prophecy that he would lead us to success. He has done so. ("Hear, hear" and applause). He has led us to a success far beyond our expectations. I have the equal pleasure to-day, though it is a pleasure tinged with regret, of proposing a vote of thanks to Lord Stradbroke for his conduct in the Chair during the past year. (Applause.) We all, I know, enjoyed working under him, and I only hope that he has found us an orderly body. By his uniform courtesy on every occasion he has endeared himself to all of us, and by his conduct in the Chair he has won our admiration. If to-day he feels regret on leaving the position of President of this great Society, I can assure him that we are sorry to lose him. ("Hear, hear" and applause.)

I beg to move a vote of thanks to the Earl of Stradbroke for his services as President during the year. (Applause.)

Sir Arthur Hazlerigg: My Lords, Ladies and Gentlemen, it is a very great pleasure indeed to me, in the absence of Lord Mildmay, to second this vote of thanks to Lord Stradbroke for his services this year. I have not had the privilege of the gentleman who proposed the adoption of the Report; I cannot say I have attended the Royal Shows since 1889, but I have done so for the last twenty-five or twenty-six years, and I do not think that any Show that I have ever attended was more pleasant than that which was held at Ipswich this year. ("Hear, hear" and applause.) Everyone was so extraordinarily helpful; everyone was so kind and so courteous, from the President downwards. I should like to give you one small example. I have always been trying to get a little more ventilation into the Flower Show. I know that many of you have thought it was needed. When we got to Ipswich I mentioned the matter to the Electricity Committee, and their Chief Officer at once said: "Oh, I will rig you up something," and for the first time we had at any rate a slight draught inside the Flower Show. I think it was the example set by our President, Lord Stradbroke, that helped to make the Ipswich Show so extraordinarily successful and one which will always linger in our memories as one of the most pleasant shows that we have ever had the privilege of attending. (Applause.) That is why it is such a great pleasure to me to-day to second the vote of thanks to Lord Stradbroke.

I put the motion to the meeting that we give our heartiest thanks to Lord Stradbroke for his services during his year of office.

The resolution was carried with acclamation.

The President: Mr. Adeane, Sir Arthur Hazlerigg, My Lords, Ladies and Gentlemen, I am rather overwhelmed by your kindness in receiving this proposition with so much heartiness. I do appreciate it very much, and I am very grateful to the proposer and seconder for the way in which they have put the proposal before you. It has naturally been a great pleasure to me, as well as a great honour, to have been the President of this Society during the last twelve months. Mr. Adeane said that he hoped I had found you an orderly body. I am sure no body of ladies and gentlemen could have behaved with greater order. (Laughter.) My work all through has been made most pleasant and agreeable by the kind and courteous assistance I have received from everybody. As you know, your Society is very well organised. ("Hear, hear.") All the work that has to be done is thought out and carefully and methodically arranged.

Last year, Mr. Adeane, in proposing me as your President, humorously said that he supposed I had been spending my life plunging over Suffolk ploughs on Suffolk horses. I think we did feel that the Suffolk horses helped to pull us through.

Certainly I have regrets in retiring from the position of President, because it has been such a very pleasant and delightful post to occupy. It will always remain a very happy memory in my mind that I have had the great honour of presiding over this Society during a very successful year, when it has rendered, I know, such very great help to agriculture generally and especially to East Anglia, where I have spent the greater part of my life.

I thank you all, Ladies and Gentlemen, for the support you have given me not only to-day but at the Council and General meetings which I have attended during my year of office. (Applause.)

Royal Agricultural Society of England.

AWARDS OF PRIZES AT IPSWICH, 1934.

ABBREVIATIONS.

I., First Prize. II., Second Prize. III., Third Prize. IV., Fourth Prize. V., Fifth Prize. VI., Sixth Prize. R.N., Reserve Number. H.C., Highly Commended. C., Commended.

The responsibility for the accuracy of the description or pedigree and for the eligibility to compete of the animals entered in the following classes, rests solely with the Exhibitors.

Unless otherwise stated, each Prize Animal in the Classes for Horses, Cattle, Goats, Sheep, and Pigs, was "bred by Exhibitor".

HORSES.

Shires.[1]

Class 1.—*Shire Stallions born in* 1931.

6 I. £20 & Champion.[2]—James Forshaw & Sons, Carlton-on-Trent, Newark, for **Raans Clansman 41267**, black, bred by W. Clark & Son, Raans Farm, Amersham; *s.* Theale Richard 40179, *d.* 118821 Raans Actress *by* Sundridge Nulli Secundus 36952.

4 II. £10.—J. Morris Belcher, Tibberton Manor, Wellington, Shropshire, for **Harboro Goldfinder 41177**, dark brown, bred by H. R. Guilford, Muswell Leys, Lutterworth; *s.* Kirkland Mimic 39739, *d.* 118655 Muswell Leys Royal Carnation *by* Mellington Royal 31650.

7 III. £7.—G. R. C. Foster, Alstey Hall, Trumpington, Cambridge, for **Bower Nulli Secundus 41100**, bay; *s.* Statfold Nulli Secundus 40170, *d.* 119635 Eveline *by* Lincoln What's Wanted 2nd 35812.

2 IV. £5.—Thomas Balderston & Son, New York, Lincoln, for **Althorpe Premier 41080**, bay, bred by Richard Glew, Trentside House, Althorpe, Scunthorpe; *s.* Rattler 4th 40380, *d.* 115201 Reedness Ivy *by* Wyresdale Draughtsman 34481.

H.C.—1, 9.

Class 2.—*Shire Stallions, born in* 1932.

14 I. £20.—William J. Cumber, Theale, Berks., for **Haseley Harvester 41415**, brown, bred by Milton Harris, Little Milton, Oxon.; *s.* Pendley Harvester 40368, *d.* 122030 Haseley Clansman's Lady *by* Cowage Clansman 38767.

16 II. £10.—The Duke of Devonshire, K.G., Chatsworth, Bakewell, for **Chatsworth Blend 41368**, dark brown, bred by Col. A. F. Nicholson, Stockwell House, Leek; *s.* Edingale Blend 40272, *d.* 119855 Leek Coral *by* Pendley Footprint 37728.

10 III. £7.—His Majesty the King, Sandringham, Norfolk, for **Appleton Binder 41341**, brown; *s.* Pendley Harvester 40368, *d.* 121191 Pendley Choice *by* Monks Green Friar 35891.

19 IV. £5.—E. W. Webb, Wickham Lodge, Cooden Drive, Bexhill-on-Sea, for **Old House Goalkeeper**, brown, bred by William Seals, Offcote Grange, Ashbourne; *s.* Chearsley Surprise 40498, *d.* Blossom *by* Copley Nulli Secundus 38565.

Class 3.—*Shire Stallions, born in* 1933.

25 I. £20 & R.N. for Champion.[2]—James Gould, Crouchley Hall, Lymm, Cheshire, for **Lymm Hyperion**, bay, bred by T. Hilton, Raikes Hall Farm, Great Eccleston, Lancs. *s.* Edingale Blend 40272, *d.* 126064 Flower *by* Lincoln What's Wanted 2nd 35812.

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[1] £319 towards these Prizes were given by the Shire Horse Society.

[2] Champion Gold Medal, and £5 to the Reserve, given by the Shire Horse Society for the best Stallion. A Prize of £2 is also given by the Shire Horse Society to the Breeder of the Champion Stallion, provided the Breeder is a Member of the Shire Horse Society, and the dam of the animal is registered in the Shire Horse Stud Book.

22 II. £10.—WILLIAM J. CUMBER, Theale, Berks., for **Theale Select**, brown, bred by Matthew Hubbard, Eaton, Grantham; *s.* Leek Wonder 40105, *d.* 120980 Landyke Latest Fashion *by* Haseley Prince Harold 35681.

26 III. £7.—MRS. A. T. LOYD, Lockinge House, Wantage, for **Lockinge Talisman**, dark bay; *s.* Ridgeway Renown 41030, *d.* 125465 Lockinge Amulet *by* Lockinge Mandarin 39744.

24 IV. £5.—G. R. C. FOSTER, Anstey Hall, Trumpington, Cambridge, for **Bower Black and White**, black; *s.* Bower Winalot 40672, *d.* 120593 Bower Marchioness 2nd *by* Withy Pitts Gay Prince 39072.

21 R.N.—WILLIAM J. CUMBER, for **Alnwick Monarch**.
H.C.—23.

Class 4.—*Shire Mares, with their own foals at foot.*

31 I. £20.—SIR GOMER BERRY, Bart., Pendley Stock Farms, Tring, for 124276 **Westonavon Monk's Charity**, bay, born in 1926 [foal *by* Pendley King Cole 41247], bred by R. Bluck, Weston Farm, Stratford-on-Avon; *s.* Ingon Champion 39222, *d.* 110579 Westonavon Nun *by* Eaton Monk 22321.

32 II. £10.—A. H. CLARK & SON, Moulton Eaugate, Spalding, for 121579 **Alsager Peach**, bay, born in 1927 [foal *by* Bower Winalot 40672], bred by T. S. Pidduck, Corbrook Court, Audlem, Cheshire; *s.* Moulton Harboro 39559, *d.* 101014 Alsager Future Queen *by* Champion's Goalkeeper 30296.

38 III. £7.—A. THOMAS LOYD, Lockinge House, Wantage, for 114377 **Hanbury Harboro Starlight**, bay, born in 1922 [foal *by* Ridgeway Renown 41030], bred by J. F. Gallimore, Fauld House, Hanbury; *s.* Harboro Nulli Secundus 33231, *d.* 90623 Sussex Menestrel's Lass *by* Norbury Menestrel 23548.

33 IV. £5—G. R. C. FOSTER, Anstey Hall, Trumpington, Cambridge, for 125597 **Pendley Lady May**, brown, born in 1931 [foal *by* Bower Winalot 40672], bred by Sir Gomer Berry, Bart., Pendley Stock Farms, Tring; *s.* Pendley Harvester 40368, *d.* 118409 Kerry Clannish Maid *by* Basildon Clansman 36277.

39 R.N.—E. W. WEBB, Wickham Lodge, Cooden Drive, Bexhill-on-Sea, for **Bierton Champion's Duchess**.
H.C.—36.

Class 5.—*Shire Colt or Filly Foals, the produce of Mares entered in Class* 4.

42 I. £10.—SIR GOMER BERRY, Bart., Pendley Stock Farms, Tring, for bay filly, born March 16; *s.* Pendley King Cole 41247, *d.* 124276 Westonavon Monk's Charity *by* Ingon Champion 39222.

50 II. £8.—E. W. WEBB, Wickham Lodge, Cooden Drive, Bexhill-on-Sea, for black colt, born March 31; *s.* Kirkland Black Friar 40320, *d.* 123583 Bierton Champion's Duchess *by* Hedges Champion's Surprise 39509.

47 III. £5.—ERNEST W. HEADINGTON, Cippenham Court, Slough, for bay colt, born April 6; *s.* Ridgeway Renown 41030, *d.* 118000 Cippenham Marjorie *by* Cippenham Draughtsman 38109.

49 R.N.—A. THOMAS LOYD, Lockinge House, Wantage, for **Lockinge Venus**.

Class 6.—*Shire Mares, born in or before* 1930, *not having foals at foot. A Mare* 6 *years old or over must have produced a live foal in* 1933 *or* 1934.

52 I. £15.—SIR GOMER BERRY, Bart., Pendley Stock Farms, Tring, for 122744 **Albany Queen**, bay, born in 1928 [filly foal born Feb. 6, 1933, *by* Pendley Harvester 40368], bred by W. Webster & Son, Newstead Farm, Stockton-on-Forest; *s.* Darley Wild Wave 38149, *d.* 113420 Albany March Countess *by* March King 34055.

54 II. £10.—LT.-COL. T. W. DANIEL, Carlton House, Mettingham, Bungay, for 121081 **Mettingham Ladyship**, brown, born in 1926 [filly foal born May 19, 1933, *by* Maidencourt Monarch 40565], bred by Percy Toone, Wolvey Grange, Hinckley; *s.* Pendley Record 35951, *d.* 101175 Barn Friar's Mistress *by* Friar Tuck 4th 31447.

Class 7.—*Shire Fillies, born in* 1931.

57 I. £20.—HIS MAJESTY THE KING, Sandringham, Norfolk, for 125101 **Appleton Morna**, bay; *s.* Appleton Wyresdale 40202, *d.* 94695 Normanby Mona *by* Normanby Briar King 32672.

59 II. £10.—W. CLARK & SON, Raans Farm, Amersham, for 125635 **Raans Wild Rose**, brown; *s.* Pendley Harvester 40368, *d.* 114853 Gunby Autumn Briar Rose *by* Normanby Briar King 32672.

60 III. £7.—JAMES FORSHAW & SONS, Carlton-on-Trent, Newark, for 125632 **Queen of the Waves**, brown, bred by Herby Ward & Sons, Emneth, Wisbech; *s.* Carlton Wild Wave 40049, *d.* 123347 Royal Violet *by* Royal Hero 4th 37738.

64 IV. £5.—H. EADY ROBINSON, Higham Ferrers, Northamptonshire, for 125455 **Lillingstone Mystery**, brown, bred by F. T. & A. W. Lester, Bernwood, Botolph Claydon, Winslow; *s.* Theale Richard 40179, *d.* 120584 Botolph Lively *by* Theale Norbury 39033.

61 R.N.—SIR BERNARD GREENWELL, Bart., Marden Park, Woldingham, for **Marden Abbess**.

Class 8.—*Shire Fillies, born in* 1932.

72 I. £20 & Champion.[1]—JAMES GOULD Crouchley Hall, Lymm, Cheshire, for 126214 Lymm Lady Grey, grey, bred by George Roberts, Hazelmere, Creswell, Mansfield; *s.* Carlton Grey Kingmaker 40240, *d.* 118333 Hazelmere Frieze *by* Harboro Nulli Secundus 33231.

68 II. £10.—A. H. CLARK & SON, Moulton Eaugate, Spalding, for 126265 Moulton Gloria black; *s.* Eaton Premier King 39436, *d.* 123223 Moors Charm *by* Moulton Harboro 39559.

71 III. £7.—G. R. C. FOSTER, Anstey Hall, Trumpington, Cambridge, for 125908 Bower Muriel, bay; *s.* Bower Winalot 40672, *d.* 120593 Bower Marchioness 2nd *by* Withy Pitts Gay Prince 39072.

73 IV. £5.—SIR BERNARD GREENWELL, Bart., Marden Park, Woldingham, for 126226 Marden Blanche, bay; *s.* Marden Valiant 40766, *d.* 121058 Marden Thistle *by* Champion's Goalkeeper 30296.

Class 9.—*Shire Fillies, born in* 1933.

87 I. £20 & R.N. for Champion.[1]—H. EADY ROBINSON, Higham Ferrers, Northamptonshire, for Lillingstone Lady Winalot, brown; *s.* Bower Winalot 40672, *d.* 121729 Bower Starlight *by* Histon Goalkeeper 39218.

85 II. £10.—A. THOMAS LOYD, Lockinge House, Wantage, for Lockinge Harvest Moon, bay; *s.* Ridgeway Renown 41030, *d.* 114377 Hanbury Harboro Starlight *by* Harboro Nulli Secundus 33231.

81 III. £7.—G. R. C. FOSTER, Anstey Hall, Trumpington, Cambridge, for Bower Choru Girl, bay; *s.* Bower Winalot 40672, *d.* 120596 Bower Queenmaker *by* Histon Goal keeper 39218.

82 IV. £5.—G. R. C. FOSTER, for Bower Regina, bay; *s.* Bower Winalot 40672, *d.* 121788 Cippenham Regina *by* Monk's Green Friar 35891.

Class 10.—*Shire Geldings, by registered sires, born in or before* 1930.

93 I. £20.—CHARLES FRANKLIN, 10, Bank Buildings, Bedford, for Pendley Warrant, bay, born in 1928, bred by Bibby Bros., Coat Green Farm, Carnforth; *s.* Lincoln What's Wanted 2nd 35812, *d.* 111306 Coat Green Encore *by* Rokeby Clansman 36023.

90 II. £15.—CHARLES FRANKLIN, for Ding Dong, brown, born in 1930, bred by J. Green, Rothwell, Leeds; *s.* Bower Goalkeeper 39849.

98 III. £10.—MANN, CROSSMAN & PAULIN, LTD., Albion Brewery, Whitechapel Road, London, E.1, for Raans Perfection, bay, born in 1929, bred by W. Clark & Sons, Raans Farm, Amersham; *s.* Cippenham Recorder 39866.

101 IV. £5.—MANN, CROSSMAN & PAULIN, LTD., for Tinker, black, born in 1929, bred by Mrs. E. Phillips & Sons, Caerleon, Whitland, S. Wales; *s.* Kirkland Mimic 39739.

97 V. £5.—MANN, CROSSMAN & PAULIN, LTD., for Common, bay, born in 1928, bred by W. P. Holder, Clifton-on-Teme, Worcs.; *s.* Draughtsman's Blend 39164.

102 VI. £5.—MANN, CROSSMAN & PAULIN, LTD., for Victor, bay, born in 1929, bred by Mr. Cope, Beamesh, Uttoxeter; *s.* Premier Clan Leader 40149.

104 R.N.—YOUNG & CO.'S BREWERY LTD., Ram Brewery, Wandsworth, London, S.W.18, for Wandle Clansman.
H.C.—92, 95.

Class 11.—*Shire Geldings, by registered sires, born in* 1931 *or* 1932.

110 I. £20.—MANN, CROSSMAN & PAULIN, LTD., Albion Brewery, Whitechapel Road, London, E.1, for Monarch, bay, born in 1931, bred by Robert Simpson, Forton, Preston; *s.* Maryshall Briar King 40116.

105 II. £15.—THE DUKE OF BEDFORD, K.G., Woburn Abbey, Bletchley, for Woburn Combination, brown, born in 1931; *s.* Bradgate Premier 39651, *d.* 124309 Woburn Romance *by* Lucky Dog 39250.

107 III. £10.—CHARLES FRANKLIN, 10 Bank Buildings, Bedford, for Marston, bay, born in 1931, bred by W. Parkin, Great Grimbles Farm, Cockerham, Lancaster; *s.* Carlton Grey Kingmaker 40240, *d. by* Shavington Caesar 33531.

108 IV. £5.—SIR BERNARD GREENWELL, Bart., Marden Park, Woldingham, for Marden Bouncer, bay, born in 1932; *s.* Marden Valiant 40766, *d.* 114788 Marden Poppy *by* Pendley Footprint 37728.

106 R.N.—CHARLES FRANKLIN, for Bedford.
H.C.—109.

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[1] Champion Gold Medal, and £5 to the Reserve, given by the Shire Horse Society for the best Mare or Filly. A Prize of £2 is also given by the Shire Horse Society to the Breeder of the Champion Mare or Filly, provided the Breeder is a Member of the Shire Horse Society, and the dam of the animal is registered in the Shire Horse Stud Book.

Class 12.—*Single Shire Horse Turnouts, mares or geldings.*

93 I. £10.—CHARLES FRANKLIN, for **Pendley Warrant.** (See Class 10.)
112 II. £5.—YOUNG & CO.'S BREWERY, LTD., Ram Brewery, Wandsworth, S.W.18, for **Bower King John**, brown gelding, born in 1924, bred by G. R. C. Foster, Anstey Hall, Trumpington, Cambridge; *s.* Withy Pitts Gay Prince 39072.
102 III. £5.—MANN, CROSSMAN & PAULIN, LTD., for **Victor.** (See Class 10.)
97 IV. £5.—MANN, CROSSMAN & PAULIN, LTD., for **Common.** (See Class 10.)

Class 13.—*Pairs of Shire Horses, mares, geldings or mixed, in harness with vehicle.*

97 & 102 I. £10.—MANN, CROSSMAN & PAULIN, LTD., for **Common and Victor.** (See Class 10.)
112 & 116 II. £5.—YOUNG & CO.'S BREWERY, LTD., for **Bower King John** (see Class 12) and **Wandle Jonathan**, bay gelding, born in 1925, bred by J. Draper & Son, Wilden, Bedford; *s.* Dogdyke Jonathan 38785.
111 & 115 III. £5.—MANN, CROSSMAN & PAULIN, LTD., for **Lancaster**, bay gelding, born in 1923, bred by Christopher Fox, Bank End, Cockerham; *s.* Sundridge Nulli Secundus 36952, and **Druid**, dark bay gelding, born in 1927, bred by R. J. Gardner, Valley, Anglesey; *s.* Belvidere Tut 39098.
104 & 114 R.N.—YOUNG & CO.'S BREWERY, LTD., for **Wandle Clansman and Wandle Punch.**
H.C.—91 and 93. C.—94 and 95.

Class 14.—*Teams of Three or Four Horses, mares, geldings, or mixed, in harness with vehicle.*

121 I. Silver Cup and £5.—YOUNG & CO.'S BREWERY, Ltd. **Team of Three.**
120 II. £5.—MANN, CROSSMAN & PAULIN, LTD. **Team of Four.**
117 III. £5.—CHARLES FRANKLIN. **Team of Three.**
119 IV. £5.—MANN CROSSMAN & PAULIN, LTD. **Team of Four.**

Clydesdales.

Class 15.—*Clydesdale Stallions, born in* 1932.

125 I. £20 & Champion.[1]—T. & M. TEMPLETON, Sandyknowe, Kelso, for **Watchword 22355**, dark roan; *s.* Benefactor 20867, *d.* Eva 57351 *by* Tristan 20478.
123 II. £10.—ALEXANDER CLARK, Strathore House, Thornton, Fife, for **Strathore Stalwart 22342**, brown, bred by James Gray, Stravithie, Fife; *s.* Woodbank Majestic 21393, *d.* Crawfordston Madge 59366 *by* Botha 19026.
124 III. £5.—HENRY MURDOCH, Balgreen, Hollybush, for **Balgreen Castle 22221**, brown; *s.* Douglas Castle 21620, *d.* Balgreen Remembrance 59071 *by* Farleton Footprint 20752.

Class 16.—*Clydesdale Stallions, born in* 1933.

130 I. £20 & R.N. for Champion.[1]—T. & M. TEMPLETON, Sandyknowe, Kelso, for **Hyperion**, brown, bred by Alexander Murdoch, East Hallside, Cambuslang; *s.* Grenadier 21496, *d.* Onaway 60061 *by* Benefactor 20867.
127 II. £10.—HENRY MURDOCH, Balgreen, Hollybush, for **Balgreen Inspiration**, black, bred by G. M. Beck, The Lane, Ravenstonedale; *s.* Douglas Castle 21620, *d.* Lane Snowflake 59747 *by* Benefactor 20867.
129 III. £5.—T. & M. TEMPLETON, for **Grand National**, bay, bred by J. & J. Gray, Ardlaw Mains, Fraserburgh; *s.* Benedictine 21836, *d.* Ardlaw Queen 58948 *by* Benefactor 20867.

Class 17.—*Clydesdale Mares, born in or before* 1931.

135 I. £20 & Champion.[2]—LORD DALZIEL, Borgue House, Kirkcudbright, for **Charm o' Borgue**, grey roan, born in 1930, bred by Henry Murdoch, Balgreen, Hollybush, Ayr; *s.* Douglas Castle 21620, *d.* Balgreen Mayflower 58200 *by* Craigie Prince Charming 20534.
134 II. £10 & R.N. for Champion.[2]—GEORGE M. BECK, The Lane, Ravenstonedale, Westmorland, for **Lane Snowflake 59747**, black, born in 1928, bred by H. E. Roberts, Mereside, Wigton; *s.* Benefactor 20867, *d.* Snowflake 48867 *by* Dunure Footprint 15203.
140 III. £5.—ROBERT TAYLOR, Milton Hall, Brampton Junction, for **Milton June 60188**, brown, born in 1929, brd by William Mather, Milne-Graden, Coldstream; *s.* Benefactor 20867, *d.* Queen of Bombie 46112 *by* Signet 16816.

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[1] Champion Silver Medal given by the Clydesdale Horse Society for the best Stallion.
[2] Champion Silver Medal given by the Clydesdale Horse Society for the best Mare or Filly.

Class 18.—*Clydesdale Fillies, born in* 1932.

143 I. £20.—William L. Ferguson, Cairnweil, Stranraer, for **Cairnweil Vanessa**, bay, bred by James McGaw, Mountpleasant, Stranraer; *s.* Craigweil 21739, *d.* Mountpleasant Vanessa 57672 *by* Dunure Measure 20744.
141 II. £10.—George M. Beck, The Lane, Ravenstonedale, for **Rosebloom**, dark brown, bred by C. S. Elliot, Charter House, Kelso; *s.* Benefactor 20867, *d* Auchenbloom 59827 *by* Auchenmount 20699.
142 III. £5.—Lord Dalziel, Borgue House, Kirkcudbright, for **Bess o' Borgue**, black, bred by George Argo, Petty, Fyvie; *s.* Benefactor 20867, *d.* Dunure Roseway 53302 *by* Auchenflower 12007.

Class 19.—*Clydesdale Geldings by registered sires, born in or before* 1931.[1]

146 I. £20.—James Clark, Windlaw, Carmunnock, for **Arthur**, brown, born in 1928, bred by W. F. Bainbridge, South Field, Appleby; *s.* Cumberland Expectation 21325, *d.* Moor End Jess *by* Cumberland Fashion 19982.
145 II. £10.—Sir Kenneth S. Anderson, Bart., K.C.M.G., The Yair, Galashiels, for **Milord**, brown, born in 1931, bred by R. Jeffrey, Torryburn, Fife; *s.* Cragston Mount Royal 20721.
149 III. £5.—William Kerr, Bell Mount, Penrith, for **Scotlaw**, brown, born in 1931, bred by Isaac Milburn, Drawdykes Castle, Carlisle; *s.* Ardyne Refiner 19606.

Suffolks.[2]

Class 20.—*Suffolk Stallions, born in or before* 1930.

158 I. £20, Champion[3] & Special.[4]—A. H. Huddlestone, Moorhouse Farm, Methley Leeds, for **Martlesham Beau Ideal** 5997. born in 1928, bred by Aldrich Bros., Martlesham, Woodbridge; *s.* Tattingstone Beau Esprit 4927, *d.* Bawdsey Connie Edis 11853 *by* Morston Connaught 4590.
157 II. £15.—Stowmarket Heavy Horse Society, Stowmarket, for **Holkham Pioneer** 6120, born in 1928, bred by the Earl of Leicester, Holkham, Norfolk; *s.* Horstead Punchinello 5096, *d.* Holkham Pansy 12767 *by* Bawdsey Earl 4736.
156 III. £10.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Woolverstone Beaufort** 6126, born in 1930, bred by the late J. A. Berners, Woolverstone Park, Ipswich; *s.* Fornham Beatty 4942, *d.* Ruby 10877 *by* Morston Gold Guard 4234.
161 IV. £5.—Dennis Walker, Trowse, Norwich, for **Riddlesworth Viscount** 6186, born in 1930, bred by W. L. N. Champion, Riddlesworth Hall, Thetford; *s.* Shotley Counterpoint 5609; *d.* Riddlesworth Gloria 12478 *by* Morston Gold Guard 4234.
154 V. £4.—Arthur T. Pratt, Morston Hall, Trimley, Ipswich, for **Worlingworth Bonfire** 6244, born in 1930, bred by Edwin H. Preston, Worlingworth, Suffolk; *s.* Bawdsey Bountiful 5551, *d.* Freda 8137 *by* Morston Marshal 3998.
159 VI. £3.—Dennis Walker, for **Lord Foch of Frithville** 6174, born in 1929, bred by F. S. Fairweather, Whatfield; *s.* Sudbourne Foch 4869, *d.* Hadleigh Ceres 13598 *by* Ashmoor Cornsheaf 5286.
162 R.N.—R. Eaton White, Boulge Hall, Woodbridge, for **Boulge Sailor.**

Class 21.—*Suffolk Stallions, born in* 1931.

170 I. £20, R.N. for Champion[3] & R.N. for Special.[4]—R. H. & R. Paul, Broxtead, Sutton, Woodbridge, for **Broxtead Vanguard** 6303; *s.* Horstead Vanguard 4784, *d.* Nortonean Prude 12929 *by* Fakenham Peter 5053.
176 II. £15.—A. A. Walker, Watering Farm, East Dereham, for **Moulton Victory** 6332, bred by Denny Wright, Morley House, Moulton St. Mary, Norwich; *s.* Moulton Sultan 5816, *d.* Moulton Gladys 13277 *by* Sudbourne Chieftain 5029.
169 III. £10.—B. S. King, Rushmere Hall, Ipswich, for **Roundwood Royal Duke** 6202; *s.* Darsham Duke 5878, *d.* Duchess 8997 *by* Morston Gold Guard 4234.
165 IV. £5.—E. S. Buck & Son, Sycamore Farm, Raveningham, Norwich, for **Morston Peer** 6222, bred by Arthur T. Pratt, Morston Hall, Trimley, Ipswich; *s.* Darsham Duke 5878, *d.* Orwell Bee 12705 *by* Orwell Gold Sun 5163.
173 V. £4.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Bawdsey Dear Sir** 6228, bred by Sir Cuthbert Quilter, Bart., Bawdsey, Woodbridge; *s.* Sir Harry of Morston 5676, *d.* Bawdsey Dear 11352 *by* Bawdsey Hay 4188.
175 VI. £3—Gerald E. F. Tenison, Overbury Hall, Hadleigh, Suffolk, for **Morston Duce** 6299, bred by Arthur T. Pratt, Morston Hall, Trimley, Ipswich; *s.* Darsham Duke 5878, *d.* Morston Faithful 13177 *by* Shotley Counterpart 4903.
164 R.N.—G. H. Berners, Woolverstone Park Ipswich, for **Woolverstone Eclipse.**
H.C.—172.

[1] Prizes given by the Clydesdale Horse Society.
[2] £312 towards these prizes was given by the Suffolk Horse Society
[3] The "Coronation" Perpetual Silver Challenge Cup given by the Suffolk Horse Society for the best Stallion.
[4] Special Prize of £10 given by the Suffolk Horse Society to the winner of the Challenge Cup.

Class 22.—*Suffolk Stallions, born in* 1932.

197 I. £20.—Denny Wright, Morley House, Moulton St. Mary, Norwich, for **Moulton Earl** 6356; *s.* Moulton Sultan 5816, *d.* Moulton Maisie 13735 *by* Sudbourne Baronet 5331.

188 II. £15.—Arthur T. Pratt, Morston Hall, Trimley, Ipswich, for **Golden Grain of Morston** 6296, bred by W. Kindred, Woodbridge; *s.* Woolverstone Gold Dust 5530, *d.* Park Stella 12728 *by* Mickfield Wedgewood 5088.

177 III. £10.—T. J. Bailey, Hill Farm, Roxwell, Chelmsford, for **Moulton Dastur** 6286, bred by Denny Wright, Morley House, Moulton St. Mary, Norwich; *s.* Moulton Sultan 5816, *d.* Willingale Dazzle 10254 *by* Sudbourne Beau Brocade 4235.

186 IV. £5.—Stuart Paul, Kirton Lodge, Ipswich, for **Harvester of Samford** 6327, bred by W. Pipe, Boyton Hall, Woodbridge; *s.* Horstead Vanguard 4784, *d.* Broxtead Princess 12265 *by* Framlingham Allenby 4826.

194 V. £4.—Gerald E. F. Tenison, Overbury Hall, Hadleigh, Suffolk, for **Overbury Hero** 6284; *s.* Sudbourne Foch 4869, *d.* Daisydi 12570 *by* Bawdsey Knave of Diamonds 4837.

179 VI. £3.—W. G. Harvey, Steward Elms Farm, Great Stambridge, Rochford, for **Kentish Warrior** 6401; *s.* Blyford Seabroc 5467, *d.* Ringshall Cavell 10080 *by* Freston Marshal 4420.

185 R.N.—R. H. & R. Paul, Broxtead, Sutton, Woodbridge, for **Broxtead Jupiter**.
H.C.—191. C.—192, 193.

Special Prizes for Suffolk Stallions that have the best feet.

195 I. £5.—Dennis Walker, for **Billie Boy**.
176 II. £3.—A. A. Walker, for **Moulton Victory**.
186 III. £2.—Stuart Paul, for **Harvester of Samford**.
154 R.N.—Arthur T. Pratt, for **Worlingworth Bonfire**.

Class 23.—*Suffolk Stallions, born in* 1933.

198 I. £20.—P. Adams & Sons, Laurel Farm, Felixstowe, for **Laurel Wedgewood** 6352; *s.* Bawdsey Sir Roger 5970, *d.* Laurel Keepsake 14926 *by* Shotley Counterpart 4903.

199 II. £15.—E. S. Buck & Son, Sycamore Farm, Raveningham, Norwich, for **Woolverstone Checkmate 2nd** 6375, bred by the late J. A. Berners, Woolverstone Park, Ipswich; *s.* Tendring Foch 6044, *d.* Woolverstone Maid 10298 *by* Woolverstone Monarch 4266.

204 III. £10.—J. A. Marsden Popple, Daneshill, Stevenage, for **Harken of Daneshill** 6402, bred by E. S. Buck & Son, Raveningham, Norwich; *s.* Sudbourne Premier 4963, *d.* Hexton Constance 15724 *by* Shotley Counterpart 4903.

209 IV. £5.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Wratting Gold Standard** 6370; *s.* Red Gold of Wratting 5932, *d.* Wratting Empress 15236 *by* Bawdsey Emperor 5717.

201 V. £4.—J. B. Dimmock, Shotford Hall, Harleston, for **Ditchingham Masterpiece** 6411, bred by the Exors. of W. Carr, Ditchingham Hall, Bungay; *s.* Sudbourne Premier 4963, *d.* Ditchingham Primrose 15776 *by* Woolverstone Checkmate 4683.

200 VI. £3.—J. W. Bullard, Willingham Hall, Beccles, for **Hall Boy** 6415, bred by Mrs. I. M. Eastcott, Wissett; *s.* Overbury Despot 5982, *d.* Newall Star 14026 *by* Huntingfield Duke 4755.

211 R.N.—Dennis Walker, Trowse, Norwich, for **Trowse Lord Foch**.
H.C.—202. C.—210.

Class 24.—*Suffolk Mares, with their own foals at foot.*

215 I. £20 & R.N. for Champion.[1]—P. Adams & Sons, Laurel Farm, Felixstowe, for **Laurel Keepsake** 14926, born in 1928 [foal *by* Bawdsey Sir Roger 5970]; *s.* Shotley Counterpart 4903, *d.* Bawdsey Propriety 11355 *by* Bawdsey Hay 4188.

235 II. £15.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Ursula** 15235, born in 1928 [foal *by* Red Gold of Wratting], bred by W. H. Allen, Harkstead Hall, Ipswich; *s.* Fornham Beatty 4942, *d.* Marigolds Bloom 11469 *by* Woolverstone Checkmate 4683.

219 III. £10.—G. H. Berners, Woolverstone Park, Ipswich, for **Woolverstone Beatrice** 15465, born in 1929 [foal *by* Woolverstone Eclipse 6207], bred by the late J. A. Berners, Woolverstone Park; *s.* Woolverstone Gold Dust 5530, *d.* Wood Beauty 12223 *by* Sudbourne Beau Brocade 4235.

221 IV. £5 & Trophy.[2]—E. S. Buck & Son, Sycamore Farm, Raveningham, Norwich, for **Hexton Constance** 15724, born in 1929 [foal *by* Sudbourne Premier 4963], bred by Sir James Hill, Bart., Hexton Manor, Hitchin; *s.* Shotley Counterpart 4903, *d.* Morston Confidence 11416 *by* Morston Connaught 4590.

229 V. £4 & R.N. for Trophy.[2]—John Oldrin, Rushmere, Lowestoft, for **Overbury Delia** 15018, born in 1928 [foal *by* Blackmore Hopeful 5206], bred by Gerald E. F. Tenison, Overbury Hall, Hadleigh; *s.* Sudbourne Foch 4869, *d.* Doctor Jean 11186 *by* Gipping Doctor 4404.

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[1] Champion Prize of £10 given by the Suffolk Horse Society for the best Mare or Filly.
[2] The "Herman Biddell" Memorial Trophy and £7, given by the Suffolk Horse Society for the best Mare and Foal, to be judged jointly.

228 **VI. £3.**—JAMES LANG, The Home Farm, Hoxne, Diss, for **Oakley Park Golden Emblem** 15745, born in 1929 [foal *by* Darsham Duke 5878]; *s.* Admiral John 5127, *d.* Chart Kismet 12561 *by* Samford Henry 4814.

213 **R.N.**—P. ADAMS & SONS, for **Laurel Beauty.**
H.C.—231, 286. **C.**—233, 237.

Class 25.—*Suffolk Colt Foals, the produce of Mares in Class* 24.

251 **I. £10.**—ARTHUR T. PRATT, Morston Hall, Trimley, Ipswich, for foal, born Jan. 21; *s.* Darsham Duke 5878, *d.* Morston Lacy 13175 *by* Shotley Counterpart 4903.

247 **II. £8.**—CLIFFORD CLEMENT COOK, Upland Hall Farm, Bungay, for foal, born March 2; *s.* Sudbourne Premier 4963, *d.* Vera 14859 *by* Raveningham Cider Cup 5326.

256 **III. £6.**—R. EATON WHITE, Boulge Hall, Woodbridge, for foal, born March 14; *s* Boulge Sailor 5914, *d.* Boulge May Queen 12982 *by* Framlingham Allenby 4826.

246 **IV. £4.**—G. H. BERNERS, Woolverstone Park, Ipswich, for foal, born April 15; *s.* Woolverstone Eclipse 6207, *d.* Woolverstone Beatrice 15465 *by* Woolverstone Gold Dust 5530.

255 **V. £3.**—GERALD E. F. TENISON, Overbury Hall, Hadleigh, Suffolk, for foal, born Feb. 19; *s.* Shotley Counterpart 4903, *d.* Overbury Frolic 16033 *by* Sudbourne Foch 4869.

253 **VI. £2.**—JOSHUA R. SANKEY, Wyverstone Park, Stowmarket, for foal, born March 27; *s.* Darsham Duke 5878, *d.* Park Pride 13209 *by* Bawdsey Sir Douglas 4834.

250 **R.N.**—JAMES LANG, The Home Farm, Hoxne, Diss.
C.—245, 252.

Class 26.—*Suffolk Filly Foals, the produce of Mares in Class* 24.

261 **I. £10.**—E. S. BUCK & SON, Sycamore Farm, Raveningham, Norwich, for foal, born Feb. 22; *s.* Sudbourne Premier 4963, *d.* Hexton Constance 15724 *by* Shotley Counterpart 4903.

265 **II. £8.**—JOHN OLDRIN, Rushmere, Lowestoft, for foal, born March 3; *s.* Blackmore Hopeful 5206, *d.* Overbury Delia 15018 *by* Sudbourne Foch 4869.

268 **III. £6.**—FRANK SAINSBURY, Blunts Hall, Little Wratting, Haverhill, for foal, born Feb. 26; *s.* Red Gold of Wratting 5932, *d.* Nortonean Dinah 11828 *by* Horstead Vanguard 4784.

257 **IV. £4.**—P. ADAMS & SONS, Laurel Farm, Felixstowe, for foal, born March 1; *s.* Bawdsey Sir Roger 5970, *d.* Laurel Beauty 14926 *by* Shotley Counterpart 4903.

259 **V. £3.**—T. J. BAILEY, Hill Farm, Roxwell, Chelmsford, for **Roxwell Lady** 17538, born March 3; *s.* Riddlesworth Satrap 6048, *d.* Morston Counter Peace 2nd 15710 *by* Shotley Counterpart 4903.

260 **VI. £2.**—WALTER G. BREEZE, Dunmore Farm, Hardingham, Norwich, for **Ladybird** born Feb. 26; *s.* Woolverstone Baronet 6179, *d.* Carbrooke Susie 14741 *by* General John 4657.

266 **R.N.**—R. H. & R. PAUL, Broxtead, Sutton, Woodbridge, for **Broxtead Bridget.**
H.C.—271. **C.**—270.

Class 27.—*Suffolk Mares, born in or before* 1930, *not having a foal at foot. A Mare* 6 *years old or over must have produced a live foal in* 1933 *or* 1934.

279 **I. £15.**—SIR CUTHBERT QUILTER, Bart., Bawdsey, Woodbridge, for **Bawdsey Seedling** 14806, born in 1927 [filly foal born April 9, 1933, *by* Bawdsey Seer 6148]; *s.* Worlingham Red Gold 5506, *d.* Bawdsey Hayseed 9496 *by* Bawdsey Hay 4188.

273 **II. £10.**—E. S. BUCK & SON, Sycamore Farm, Raveningham, Norwich, for **Raveningham Rose Marie** 15353, born in 1929; *s.* Woolverstone Checkmate 4683, *d.* Raveningham Doreen 12357 *by* Sudbourne Foch 4869.

277 **III. £5.**—SIR CUTHBERT QUILTER, Bart., for **Bawdsey Painted Doll** 15675, born in 1929; *s.* Bawdsey Ian 5838, *d.* Bawdsey China Doll 2nd 7252 *by* Bentley War Cry 3028.

275 **IV. £4.**—THE HON. L. W. JOYNSON-HICKS, Newick Park, Sussex, for **Newick Dawn** 15694, born in 1929, bred by the late Viscount Brentford, Newick Park; *s.* Sudbourne K 4692, *d.* Darkie 10758 *by* Morston Gold Guard 4234.

284 **V. £3.**—A. WEBB, Bassetts Farm, Acton, Sudbury, Suffolk, for **B.O.K.A.** 15649, born in 1929, bred by E. H. Preston, Wood Farm, Worlingworth, Woodbridge; *s.* Bawdsey Bountiful 5551, *d.* Worlingworth Keepsake 12897 *by* Kenton Success 4749.

283 **VI. £2.**—THE EARL OF STRADBROKE, Henham Hall, Wangford, Beccles, for **Henham Olive** 15686, born in 1929; *s.* Coney Weston Scarab 5524, *d.* Henham Kelvia 13589 *by* Sudbourne Bowman 5456.

282 **R.N.**—FRANK SAINSBURY, Blunts Hall, Little Wratting, Haverhill, for **Raveningham Doreen.**
H.C.—287. **C.**—274, 285, 286.

Class 28.—*Suffolk Fillies, born in* 1931.

298 I. £20.—Sir Cuthbert Quilter, Bart., Bawdsey, Woodbridge, for **Bawdsey Ayesha** 16507; *s.* Sir Harry of Morston 5676, *d.* Bawdsey Queen of Sheba 12080 *by* Framlingham Allenby 4826.
305 II. £15.—Frank Warren, Godbolts Farm, Marks Tey, Colchester, for **Godbolts Audrey** 16534; *s.* Godbolts Hero 6027, *d.* Yeldham Honour 2nd 12951 *by* Yeldham Pan 5251.
297 III. £10.—Stuart Paul, Kirton Lodge, Ipswich, for **Samford Nectar** 16410; *s.* Buckanay Nelson 5709, *d.* Lavenham Judy 13737 *by* Wretham Dreadnought 5059.
304 IV. £5.—H. C. Steed, The Grove, Lavenham, Suffolk, for **Grove Penelope Girl** 16381; *s.* Sudbourne Foch 4869, *d.* Patience Girl 12075 *by* War Boy 4672.
309 V. £4.—Denny Wright, Morley House, Moulton St. Mary, Norwich, for **Moulton Gloriosa** 16440; *s.* Moulton Sultan 5816, *d.* Sudbourne Gloriosa 10871 *by* Sudbourne Beau Brocade 4235.
293 VI. £3.—W. G. Harvey, Steward Elms Farm, Great Stambridge, Rochford, for **Croft Donella** 16453, bred by F. Newton Pratt, Croft Farm, Kirton; *s.* Buckanay Nelson 5709, *d.* Easton Prima Donna 8631 *by* Sudbourne Peter 3955.
307 R.N.—G. Philip Woodward, White Hall, Old Newton, Stowmarket, for **Stowmarket Joan.**
H.C.—294, 308. C.—288, 290, 292, 306.

Class 29.—*Suffolk Fillies, born in* 1932.

320 I. £20 & Champion.[1]—Lady Loder, Leonardslee, Horsham, for **Leonardslee Nanette** 16638; *s.* Bawdsey Martian 6029, *d.* Ashmoor Nancy 13731 *by* Shotley Counterpart 4903.

317 II. £15.—Donald B. Hay, Duells Farm, Bredfield, Woodbridge, for **Sailor Girl** 16642, bred by P. S. Pratt, Dallinghoo, Suffolk; *s.* Boulge Sailor 5914, *d.* Boulge Madam 9420 *by* Bawdsey Hay 4188.

325 III. £10.—Sir Cuthbert Quilter, Bart., Bawdsey, Woodbridge, for **Bawdsey Secern** 16896; *s.* Bawdsey Martian 6029, *d.* Bawdsey Surety 14225 *by* Sudbourne Premier 4963.

333 IV. £5.—Denny Wright, Morley House, Moulton St. Mary, Norwich, for **Moulton Jewel 3rd** 16851; *s.* Moulton Sultan 5816, *d.* Moulton Gem 12630 *by* Bawdsey Knave of Diamonds 4837.

312 V. £4.—H. W. Daking, Rose Farm, Thorpe-le-Soken, Essex, for **Vernons Marguerite** 16629, bred by Lt.-Col. A. A. Soames, Vernons, Chappel, Essex; *s.* Tendring Foch 6044, *d.* Walton Peggy 15050 *by* Shotley Counterpart 4903.

311 VI. £3.—Sidney J. Bullock, Dagworth Farm, Old Newton, Stowmarket, for **Old Newton Countess** 16875; *s.* Shotley Counterpart 4903, *d.* Barrow Countess Violet 14300 *by* Tattingstone Count 4494.

323 R.N.—R. H. & R. Paul, Broxtead, Sutton, Woodbridge, for **Broxtead Julia.**
H.C.—319, 324. C.—314, 315.

Special Prizes for Suffolk Mares or Fillies that have the best feet.

320 I. £5.—Lady Loder, for **Leonardslee Nanette.**
215 II. £3.—P. Adams & Sons, for **Laurel Keepsake.**
307 III. £2.—G. Philip Woodward, for **Stowmarket Joan.**
306 R.N.—R. Eaton White, for **Boulge Naomi.**

Class 30.—*Suffolk Fillies, born in* 1933.

343 I. £20.—The Earl of Iveagh, C.B., C.M.G., Pyrford Court, Woking, for **Pyrford Philomel** 17166; *s.* Pyrford Paul 5793, *d.* Pyrford Philippa 13624 *by* War Boy 4672.

335 II. £15.—P. Adams & Sons, Laurel Farm, Felixstowe, for **Laurel Golden Girl** 17217; *s.* Bawdsey Sir Roger 5970, *d.* Laurel Beauty 15361 *by* Shotley Counterpart 4903.

351 III. £10.—Ernest B. Savory, Warren Farm, Streatley, Reading, for **Harkstead Ruby** 17417, bred by R. H. Wrinch, Harkstead, Ipswich; *s.* Riddlesworth Satrap 6048, *d.* Harkstead Emerald 3rd 15637 *by* Fornham Beatty 4942.

85 IV. £5.—Denny Wright, Morley House, Moulton St. Mary, Norwich, for **Moulton Princess** 17239; *s.* Moulton Sultan 5816, *d.* Moulton Pearl 13783 *by* Sudbourne Baronet 5331.

352 V. £4.—Gerald E. F. Tenison, Overbury Hall, Hadleigh, Suffolk, for **Overbury Iris** 17344; *s.* Sudbourne Foch 4869, *d.* Daisydi 12570 *by* Bawdsey Knave of Diamonds 4837.

349 VI. £3.—Sir Cuthbert Quilter, Bart., Bawdsey, Woodbridge, for **Bawdsey Virginia** 17339; *s.* Boulge Sailor 5914, *d.* Bawdsey Zia 13688 *by* Sudbourne Foch 4869.

339 R.N.—Hollesley Bay Labour Colony, Hollesley, Suffolk, for **Colony Colleen.**
H.C.—341, 353. C.—337, 342.

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[1] Champion Prize of £10 given by the Suffolk Horse Society for the best Mare or Filly.

Class 31.—*Suffolk Geldings, by registered sires, born in or before* 1929.

367 I. £20.—STUART PAUL, Kirton Lodge, Ipswich, for **Prince 2nd**, born in 1927, bred by S. Warth, Hintlesham, Ipswich; *s.* Badingham Upstart 3847, *d.* Hintlesham Dorothy 8115.
368 II. £15.—STUART PAUL, for **Short**, born in 1928, bred by Matthew Wood, Pearls Farm, Helmingham, Stowmarket; *s.* Earl of Rushmere 5719, *d.* Snowdrift 9720 *by* Butley Commander 4391.
366 III. £10.—STUART PAUL, for **Prince**, born in 1928, bred by the Exors. of Spencer Dawson, Stratton Hall, Ipswich; *s.* Shotley Counterpart 4903, *d.* Stratton Cherry 11804 *by* Earl Gray 4219.
371 IV. £5.—CAPT. THE HON. J. ST. V. SAUMAREZ, Shrubland Park, Coddenham Ipswich, for **John**, born in 1929; *s.* Shotley Counterpart 4903, *d.* Stretton Cherry 11804 *by* Earl Gray 4219.
359 V. £4.—W. G. HARVEY, Steward Elms Farm, Great Stambridge, Rochford, for **Prince**, born in 1929; *s.* Sudbourne Premier 4963, *d.* Ringshall Cavell 10080 *by* Freston Marshal 1420.
356 R.N.—H. J. BLOOMFIELD, Cretingham Lodge, Earl Soham, Woodbridge, for **Farmer**.
H.C.—360. C.—358.

Class 32.—*Suffolk Geldings, by registered sires, born in* 1930 *or* 1931.

381 I. £20.—STUART PAUL, Kirton Lodge, Ipswich, for **Stormer**, born in 1930; *s.* Woolverstone Gold Dust 5530, *d.* Samford Elizabeth 12136 *by* Sudbourne Beau Chief 4215.
382 II. £15.—SIR CUTHBERT QUILTER, Bart., Bawdsey, Woodbridge, for **Captain**, born in 1930, bred by Strutt & Parker (Farms) Ltd., Thorpe Morieux; *s.* Bawdsey Wassil, *d.* Elmsett Aster.
379 III. £10.—R. H. & R. PAUL, Broxtead, Sutton, Woodbridge, for **Major**, born in 1930; *s.* Horstead Vanguard 4784, *d.* Nortonean Prude 12929 *by* Fakenham Peter 5058.
383 IV. £5.—SIR CUTHBERT QUILTER, Bart., Bawdsey, for **Tom**, born in 1931; *s.* Sir Harry of Morston 5676.
372 V. £4.—WILFRED BEVAN, Plashwood, Haughley, Suffolk, for **Duke**, born in 1930; *s.* Sudbourne Foch 4869, *d.* Framlingham Poppy 13165 *by* Blackmore Hopeful 5206.
375 R.N.—JAMES FORREST, Tattingstone Hall, Ipswich, for **Napoleon**.
H.C.—376. C.—374, 378.
176, 177, 197 **Specials.**[1]—Winners sired by Moulton Sultan.
198, 257, 335 **R.N. for Specials.**[1]—Winners sired by Bawdsey Sir Roger.

Class 33.—*Teams of Four Suffolk Horses, mares, geldings or mixed, in harness with vehicle.*

388 I. **Cup.**—STUART PAUL, Kirton Lodge, Ipswich.
390 II. **Silver Medal.**—FRANK SAINSBURY, Blunts Hall, Little Wratting, Haverhill.
387 III. **Silver Medal.**—R. & W. PAUL, LTD., Ipswich.
389 IV. **Silver Medal.**—SIR CUTHBERT QUILTER, Bart., Bawdsey, Woodbridge.
386 V. **Silver Medal.**—WM. BROWN & CO. (IPSWICH), LTD., Grey Friars Road, Ipswich.

Class 34.—*Single Suffolk Horse Turnouts, mares or geldings.*

409 I. £10.—R. & W. PAUL, LTD., Ipswich, for **Smiler**, gelding.
405 II. £7.—R. & W. PAUL, LTD., for **Briton**, gelding, born in 1926, bred by Mrs. Russell, Buntingford; *s.* Sudbourne Ben 5460.
411 III. £5.—THE EARL OF STRADBROKE, Henham Hall, Wangford, Beccles, for **Henham Melody**, mare.
404 IV. £3.—R. H. & R. PAUL, Broxtead, Sutton, Woodbridge, for **Major**, gelding.
396 V. £3.—WM. BROWN & CO. (IPSWICH), LTD., Grey Friars Road, Ipswich, for **Duke**.
397 VI. £3.—HENGRAVE ESTATES, LTD., Hengrave, Bury St. Edmunds, for **Punch**, gelding.
412 VII. £3.—A. WEBB, for **B.O.K.A.** (See Class 27.)
407 R.N.—R. & W. PAUL, LTD., for **Marvel**.
H.C.—402, 403, 413. C.—394, 400.

Percherons.

Class 35.—*Percheron Stallions, born in or before* 1931.[2]

417 I. £20 & **Champion.**[3]—J. PIERPONT MORGAN, Wall Hall, Aldenham, Watford, for **Echevin B. 574**, grey, born in 1926, bred by M. Champion, Mortagne, France; *s.* Vassal F. 154217, *d.* Alma F. 159437 *by* Remonteur F. 134855.
415 II. £10 & **R.N. for Champion.**[3]—CHIVERS & SONS, LTD., Histon, Cambridge, for **Coldham Gunner B. 208**, grey, born in 1922, bred by Col. H. E. Hambro, C.B.E., Coldham Hall, Bury St. Edmunds; *s.* Quanteleux B. 35, *d.* Pandata B. 130 *by* Lutecien F. 102720.

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[1] Special Prizes of £3 to each owner, £3 to each breeder of sire, and £2 to each owner of sire, given by the Suffolk Horse Society for the best group of Three Registered Suffolks by the same sire.
[2] Prizes given by the British Percheron Horse Society.
[3] Perpetual Silver Challenge Cup given by the British Percheron Horse Society for the best Stallion.

419 **III. £5.**—J. PIERPONT MORGAN, for **Histon Drayman 4th B. 340**, grey, born in 1925, bred by Chivers & Sons, Ltd., Histon, Cambridge; *s.* Lagor B. 1, *d.* Ustache B. 509 *by* Qualvados F. 131498.

Class 36.—*Percheron Stallions, born in* 1932.

422 **I. £20 & Champion.**[1]—SYDNEY J. COLE, Heywood Hall, Diss, for **Stourhead Lagor 2nd B. 555**, grey, bred by Sir Henry H. A. Hoare, Bart., Stourhead, Zeals; *s.* Stourhead Lagor B. 424, *d.* Stourhead Rosalind B. 357 *by* Orlando B. 49

423 **II. £10.**—MAJOR Q. E. GURNEY, Bawdeswell Hall, East Dereham, for **Histon Favourite Lad B. 563**, dark grey, bred by Chivers & Sons, Ltd., Histon, Cambridge; *s.* Cense B. 409, *d.* Buscot Favourite B. 394 *by* Evenlode Benjamin B. 261.

420 **III. £5.**—THE BIRDSALL ESTATES CO., LTD., Birdsall, Malton, for **Aldenham Dodger B. 549**, dark grey, bred by J. Pierpont Morgan, Wall Hall, Aldenham, Watford; *s.* Histon Drayman 4th B. 340, *d.* Diablesse B. 852 *by* Quaduc F. 129371.

424 **R.N.**—COL. H. E. HAMBRO, C.B.E., Coldham Hall, Bury St. Edmunds, for **Kangourou.**

Class 37.—*Percheron Stallions, born in* 1933.

427 **I. £20 & R.N. for Champion.**[1]—CHIVERS & SONS, LTD., Histon, Cambridge, for **Histon Bold Boy B. 598**, grey; *s.* Cense B. 409, *d.* Defiance B. 854 *by* Ramoneur F. 133946.

429 **II. £10.**—SIR HENRY H. A. HOARE, Bart., Stourhead, Zeals, for **Stourhead Gog B. 579**, grey; *s.* Stourhead Lagor B. 424, *d.* Tirelire B. 484 *by* Instar F. 78857.

430 **III. £5.**—J. PIERPONT MORGAN, Wall Hall, Aldenham, Watford, for **Aldenham Usurper B. 587**, dark grey; *s.* Orton Misanthrope B. 474, *d.* Ustache B. 509 *by* Qualvados F. 131498.

Class 38.—*Percheron Mares, with their own foals at foot.*

431 **I. £20 & R.N. for Champion.**[2]—THE BIRDSALL ESTATES CO., LTD., Birdsall, Malton, for **Grosse B. 1136**, dark grey, born in 1928 [foal *by* Echo F. 175494], bred by M. Durand, Mortagne, France; *s.* Apre F. 155094, *d.* Craneuse F. 165899 *by* Souvenons F. 136704.

434 **II. £10.**—J. PIERPONT MORGAN, Wall Hall, Aldenham, Watford, for **Serverie B. 534**, grey, born in 1918 [foal *by* Orton Misanthrope B. 474], bred by M. Mailefert, Cruchet, Ventes-de-Bourse, Mese le Sarthe; *s.* Importun F. 80576, *d.* Nazareene F. 116845 *by* Heainne F. 75604.

432 **III. £5.**—CHIVERS & SONS, LTD., Histon, Cambridge, for **Histon Bright Star B. 979**, grey, born in 1930 [foal *by* Carburateur B. 403]; *s.* Cense B. 409, *d.* Sourdiere B. 319, *by* Nigaud F. 111585.

433 **R.N.**—J. PIERPONT MORGAN, for **Greyling Welcome.**

Class 39.—*Percheron Colt or Filly Foals, the produce of Mares in Class* 38.

435 **I. £10.**—THE BIRDSALL ESTATES CO., LTD., Birdsall, Malton, for **Birdsall Grace B. 1207**, grey filly, born March 4; *s.* Echo F. 175494, *d.* Grosse B. 1136 *by* Apre F. 155094.

436 **II. £5.**—CHIVERS & SONS, LTD., Histon, Cambridge, for grey colt, born April 5; *s.* Carburateur B. 403, *d.* Histon Bright Star B. 979 *by* Cense B. 409.

438 **III. £3.**—J. PIERPONT MORGAN, Wall Hall, Aldenham, Watford, for dark grey colt, born Feb. 11; *s.* Orton Misanthrope B. 474, *d.* Serverie B. 534 *by* Importun F. 80576.

437 **R.N.**—J. PIERPONT MORGAN, for dark grey colt.

Class 40.—*Percheron Mares, not having foals at foot, or Fillies, born in or before* 1931. *A Mare* 6 *years old or over must have produced a live foal in* 1933 *or* 1934.[3]

442 **I. £20 & Champion.**[2]—J. PIERPONT MORGAN, Wall Hall, Aldenham, Watford, for **Florence B. 1024**, grey, born in 1927 [colt foal born April 20, 1933, *by* Histon Drayman 4th B. 340], bred by Mme. Voe, Burin, Mamers, France; *s.* Quaimian F. 129648, *d.* Partition F. 127469 *by* Importun F. 80576.

441 **II. £10.**—J. PIERPONT MORGAN, for **Baudruche B. 685**, light grey, born in 1923 [filly foal born Feb. 3, 1933, *by* Histon Drayman 4th B. 340], bred by L. Guion-Landes, Bellou-sur-Huisne, Orne; *s.* Qroisy F. 130286, *d.* Nattiere F. 114659 *by* Joyeux F. 84874.

439 **III. £5.**—CHIVERS & SONS, LTD., Histon, Cambridge, for **Bendish Jeanelles 2nd B. 1012**, grey, born in 1931, bred by F. Russell Wood, Bendish House, Hitchin; *s.* Coldham Gunner B. 208, *d.* Evenlode Ailsa B. 461 *by* Quanteleux B. 35.

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[1] Perpetual Silver Challenge Cup given by the British Percheron Horse Society for the best Stallion in Classes 36 and 37 born in Great Britain.

[2] Perpetual Silver Challenge Cup given by the British Percheron Horse Society for the best Mare or Filly.

[3] Prizes given by the British Percheron Horse Society.

Class 41.—*Percheron Fillies, born in* 1932.

445 I. £20 & Champion.[1]—J. PIERPONT MORGAN, Wall Hall, Aldenham, Watford, for **Aldenham Beauty** B. 1093, light grey; *s.* Histon Drayman 4th B. 840, *d.* Baudruche B. 685 *by* Qroisy F. 130286.
444 II. £10.—CHIVERS & SONS, LTD., Histon, Cambridge, for **Histon Orcanette 2nd** B. 1119, dark grey; *s.* Cense B. 409, *d.* Histon Orcanette B. 771 *by* Mylord B. 275.
443 III. £5.—CHIVERS & SONS, LTD., for **Histon Fairy Girl 2nd** B. 1116, grey; *s.* Cense B. 409, *d.* Hache Xanthippa B. 563 *by* Quapulet B. 81.
446 R.N.—J. PIERPONT MORGAN, for **Aldenham Mylady.**

Class 42.—*Percheron Fillies, born in* 1933.

450 I. £20 & R.N. for Champion.[1]—J. PIERPONT MORGAN, Wall Hall, Aldenham, Watford, for **Aldenham Beautiful**, grey; *s.* Histon Drayman 4th B. 840, *d.* Baudruche B. 685 *by* Qroisy F. 130286.
447 II. £10.—CHIVERS & SONS, LTD., Histon, Cambridge, for **Histon Charm** B. 1187, light grey; *s.* Carburateur B. 403, *d.* Histon Beauty 4th B. 878 *by* Villabon B. 276.
448 III. £5.—CHIVERS & SONS, LTD., for **Histon Reverie** B. 1194, light grey; *s.* Cense B. 409, *d.* Histon Trip B. 279 *by* Oremus B. 13.
451 R.N.—J. PIERPONT MORGAN, for **Aldenham Dawn.**

Class 43.—*Percheron Geldings, by registered sires, born in or before* 1931.[2]

455 I. £20.—CHIVERS & SONS, LTD., Histon, Cambridge, for **Histon Major**, grey, born in 1927; *s.* Lagor B. 1, *d.* Petronne B. 176 *by* Japon F. 84819.
457 II. £10.—CHIVERS & SONS, LTD., for **Histon Prince**, grey, born in 1928; *s.* Villabon B. 276, *d.* Perthe B. 178 *by* Japon F. 84819.
454 III. £5.—CHIVERS & SONS, LTD., for **Captain**, grey, born in 1928, bred by Lady Violet Henderson, Buscot Park, Faringdon; *s.* Evenlode Benjamin B. 261.
463 IV. £4.—J. PIERPONT MORGAN, Wall Hall, Aldenham, Watford, for **Bellman**, grey, born in 1926, bred by Lord Kimberley, Kimberley House, Wymondham; *s.* Hobland Bellman B. 160, *d.* Quornmonde B. 229 *by* Montretout F. 106337.
456 V. £3.—CHIVERS & SONS, LTD., for **Histon Monarch**, grey, born in 1928; *s.* Villabon B. 276.
458 R.N.—COL. H. E. HAMBRO, C.B.E., Coldham Hall, Bury St. Edmunds, for **Captain.**
H.C.—459, 460, 464, 465. C.—461, 462, 466.

Class 44.—*Teams of Four Percheron Horses, stallions, mares, geldings, or mixed, in harness with vehicle.*

467 I. £20.—CHIVERS & SONS., LTD., Histon, Cambridge.
468 II. £10.—COL. H. E. HAMBRO, C.B.E., Coldham Hall, Bury St. Edmunds.
469 III. £5.—J. PIERPONT MORGAN, Wall Hall, Aldenham, Watford.

Class 45.—*Single Percheron Horse Turnouts, stallions, mares, or geldings.*[2]

457 I. £10.—CHIVERS & SONS, LTD., for **Histon Prince.** (See Class 43.)
465 II. £5.—J. PIERPONT MORGAN, for **Stourhead Fernand** B. 273, grey, born in 1928, bred by Sir Henry H. A. Hoare, Bart., Stourhead, Zeals; *s.* Stourhead Original B. 82, *d.* Finette B. 38 *by* Pinson F. 63122.
459 III. £3.—COL. H. E. HAMBRO, C.B.E., for **Coldham Goliath** B. 444, grey, born in 1929; *s.* Lagor B. 1, *d.* Evenlode Delight B. 691 *by* Evenlode Valiant B. 133.

Hunters.

Class 46.—*Hunter Mares, with their own foals at foot.*

474 I. £20 & Champion.[3]—H. R. W. MITCHELL, The Vale, Kirby Bedon, Norwich, for 6638 **The Bint**, bay, born in 1917 [foal *by* Main Royal], bred by Arthur Shepherd; *s.* Snowflake 96, *d. by* Ballinifad.
473 II. £10.—MRS. PHILIP FLEMING, Barton Abbey, Steeple Aston, Oxon., for 7288 **Redwing 7th**, bay, born in 1918 [foal *by* Pal-o'-Mine], bred by Lady de la Warr, Wimbledon Common; *s.* Red Hand, *d.* Lady Grey 2nd *by* Red Sahib 75.
472 III. £5.—MISS DORIS W. FITT, Kirkland, 173 Newmarket Road, Norwich, for 7733 **Sunbeam 9th**, chestnut, born in 1919 [foal *by* Main Royal].

Class 47.—*Hunter Mares (Novice), with their own foals at foot.*

478 I. £20 & R.N. for Champion.[3]—G. M. GIBBS, Othorpe House, Slawston, Market Harborough, for **Slawston**, bay, born in 1926 [foal *by* Periosteum].
479 II. £10.—ALFRED E. LERWILL, Pallingham Manor, Wisborough Green, Sussex, for **Nippy**, bay, born in 1928 [foal *by* Dick Swiveller], bred by Lord Leconfield, Petworth House, Petworth; *s.* Birk Gill.

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[1] Perpetual Silver Challenge Cup, given by the British Percheron Horse Society for the best Filly born in Great Britain.
[2] Prizes given by the British Percheron Horse Society.
[3] Champion Gold Medal given by the Hunters' Improvement and National Light Horse Breeding Society for the best Mare four years old and upwards, which must be either registered in the Hunter Stud Book, or the entry tendered within a month of the Award.

477 III. £5.—J. J. EMERSON, Easby Hall, Great Ayton, Yorks, for **Ladiford**, dark brown, born in 1927 [foal *by* Ballyferis], bred by Major D. Dixon, Ireland; *s.* Essexford, *d.* Blackladies *by* Belted Earl.
476 R.N.—T. J. BAILEY, Hill Farm, Roxwell, Chelmsford, for **Tutrus**.

Class 48.—*Hunter Colt Foals, the produce of Mares in Classes 46 or 47.*

485 I. £15.—ALFRED E. LERWILL, Pallingham Manor, Wisborough Green, Sussex, for **Nicotine**, bay, born April 7; *s.* Dick Swiveller, *d.* Nippy *by* Birk Gill.
487 II. £10.—H. R. W. MITCHELL, The Vale, Kirby Bedon, Norwich, for **Main Stay**, chestnut, born April 11; *s.* Main Royal, *d.* 6638 The Bint *by* Snowflake 96.
484 III. £5.—MRS. PHILIP FLEMING, Barton Abbey, Steeple Aston, Oxon., for **Red Wine**, bay, born April 16; *s.* Pal-o'-Mine, *d.* 7288 Redwing 7th *by* Red Hand.
482 R.N.—T. J. BAILEY, Hill Farm, Roxwell, Chelmsford.

Class 49.—*Hunter Filly Foals, the produce of Mares in Classes 46 and 47.*

490 I. £15.—G. M. GIBBS, Othorpe House, Market Harborough, for **Slawston**, brown, born April 29; *s.* Periosteum 647, *d.* Slawston *by* Agadir.
489 II. £10.—MISS DORIS W. FITT, Kirkland, 173 Newmarket Rd., Norwich, for **Royal Sunbrooke**, chestnut, born March 7; *s.* Main Royal, *d.* 7733 Sunbeam 9th *by* Sungirt.
488 III. £5.—J. J. EMERSON, Easby Hall, Great Ayton, Yorks., for **Laderio**, light chestnut, born April 25; *s.* Ballyferis, *d.* Ladiford *by* Essexford.

Class 50.—*Hunter Fillies, born in* 1931.

494 I. £20 & Champion.[1]—H. HINDLEY, Moorlands, Blacko, Nelson, Lancs., for 8083 **Lonesome**, chestnut, bred by Robin Lofthouse, Bishopthorpe, Yorks.; *s.* The Dark Duke, *d.* 6180 Liberty 2nd.
495 II. £10.—ALFRED E. LERWILL, Pallingham Manor, Wisborough Green, Sussex, for 7847 **Fancourt Irene**, bay, bred by Sir Edward D. Stern, Bart., Fan Court, Chertsey; *s.* Limosin, *d.* 6863 Bridget 10th *by* Copper Ore.
493 III. £5.—MISS W. DORIS FITT, Kirkland, 173 Newmarket Rd., Norwich, for 7882 **Sunbeam 10th**, bay; *s.* Express Delivery, *d.* 7733 Sunbeam 9th *by* Sungirt.

Class 51.—*Hunter Fillies, born in* 1932.

501 I. £20.—COL. H. E. HAMBRO, C.B.E., Coldham Hall, Bury St. Edmunds, for **Alexdream**, bay; *s.* Captain Fracasse, *d.* Fine Art *by* Sky Rocket.
498 II. £10.—MRS. F. M. BROOMFIELD, Longdown Chase, Hindhead, Surrey, for chestnut, bred by W. Nightingall, South Hatch, Epsom; *s.* Watford, *d.* Bruere *by* Aldford.
500 III. £5.—MISS DORIS W. FITT, Kirkland, 173 Newmarket Rd., Norwich, for 8070 **Lonebeam**, bay; *s.* All Alone, *d.* 7733 Sunbeam 9th *by* Sungirt.
499 R.N.—J. J. EMERSON, Easby Hall, Great Ayton, Yorks., for **Easby Lass**.
H.C.—502.

Class 52.—*Hunter Fillies, born in* 1933.

508 I. £20 & R.N. for Champion.[1]—J. J. EMERSON, Easby Hall, Great Ayton, Yorks., for **Easby Primrose**, bay; *s.* Erehwemos, *d.* Blue Bead *by* Adam Bede.
505 II. £10.—T. J. BAILEY, Hill Farm, Roxwell, Chelmsford, for **Diana**, light chestnut; *s.* Beachcomber, *d.* We Three *by* Somme Kiss.
512 III. £5.—MISS JOAN LYSLEY, Pewsham House, Chippenham, for **Gay Divorce**, chestnut, bred by W. J. Fryer, Holme Park, Sonning, Berks.; *s.* Bachelor's Castle, *d.* 7658 Lady Grace 4th *by* Clonmeen.
511 R.N.—FRANK H. JONES, Housham Tye, Harlow, Essex, for **Anvil**.

Class 53.—*Hunter Geldings, born in* 1931.

516 I. £20.—G. JACKSON, Wychbold Court, Droitwich, for **Buttonhole** (Supp. No. 1815), chestnut, bred by Mrs. Rowden, Bromsberrow Court, Ledbury; *s.* All Alone, *d.* Nosegay *by* Gay Lally.
514 II. £10.—MAJOR CLIVE BEHRENS, Swinton Grange, Malton, for **Swinton Solomon** (Supp. No. 1804), bay; *s.* Aynsley, *d.* 5703 Salome 2nd *by* Jovial.
515 III. £5.—H. HINDLEY, Moorlands, Blacko, Nelson, Lancs., for **Sir Andrew** (Supp. No. 1814), brown, bred by J. Fitzgerald, Lisronagh, Clonmel, Ireland; *s.* Sir Rowland, *d.* The Tanist.
519 R.N.—MRS. J. T. WIGAN, Danbury Park, Chelmsford, for **Parachute**.
H.C.—518.

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[1] Champion Gold Medal given by the Hunters' Improvement and National Light Horse Breeding Society for the best Filly under four years old, which must be either registered in the Hunter Stud Book, or the entry tendered within a month of the Award.

Class 54.—*Hunter Geldings, born in* 1932.

583 I. £20.—HORACE WARD, 38 Grantham Rd., Sleaford, for **Stair Rod**, chestnut; *s.* Back Stair, *d.* Springfield.

525 II. £10.—LORD DIGBY, D.S.O., M.C., Minterne, Dorchester, for **Easter Vision** (Supp. No. 1810) bay, bred by Alan Baker; *s.* Buen Ojo, *d.* Sister Easter *by* Friar Marcus.

523 III. £5.—C. B. CHARTRES, Mindrum, Northumberland, for **Manbridge** (Supp. No. 1670), chestnut; *s.* Corbridge, *d.* 3916 Amanda *by* King's Beadsman.

530 R.N.—MRS. J. D. PATON, Hanslope Lodge, Bletchley, for **Wrenson.**

H.C.—521, 526, 532.

Class 55.—*Hunter Colts or Geldings, born in* 1933.

537 I. £20.—JOHN EDWARD JONES, Treworgan, Llangrove, Hereford, for **Royal Flash**, bay colt, bred by Miss Joan Lysley, Chippenham; *s.* Bardsley, *d.* 7457 Sweet Pepper 2nd *by* Brandimintine.

534 II. £10.—MAJOR CLIVE BEHRENS, Swinton Grange, Malton, for **Kitchener**, bay gelding, bred by Miss Joan Kitching, The Low Hall, Pickering; *s.* Aynsley, *d.* Flying Scott.

542 III. £5.—CLAUDE S. MONSON, St. Peter's Lodge, Walpole Highway, Norfolk, for **Marshland**, bay colt; *s.* Monson's Young Blaze 225, *d.* 5209 Missel Thrush *by* Chatsworth.

543 R.N.—MRS. J. T. WIGAN, Danbury Park, Chelmsford, for **Valentino.**

Special Produce First Prize of £8 given by the R.A.S.E. for the best group of three animals in Classes 50 to 55, by the same Thoroughbred or Registered Hunter Sire. A Silver Medal was given by the Hunters Improvement and National Light Horse Breeding Society to the owner of the sire of the winning group.

Sired by EREHWEMOS.

491 **Easby Girl**, chestnut filly, exhibited by J. J. EMERSON.
499 **Easby Lass**, chestnut filly, exhibited by J. J. EMERSON.
508 **Easby Primrose**, bay filly, exhibited by J. J. EMERSON.

Polo and Riding Ponies.

Class 56.—*Polo and Riding Pony Stallions, born in or before* 1931, *not exceeding* 15 *hands.*

544 I. £20 & Champion.[1]—CAPT. W. H. FRANCE-HAYHURST, Bostock Hall, Middlewich, for **Silverdale Loyalty 1448**, dark brown, born in 1923, bred by Herbert Bright, Silverdale, Carnforth; *s.* Prince Friarstown (Supp. 1917), *d.* 4168 Silvery 2nd *by* Right For'ard 368.

551 II. £10 & R.N. for Champion.[1]—SIR IAN WALKER, Bart., Osmaston Manor, Derby, for **Knight Error 1878**, chestnut, born in 1926, bred by Allen Baker; *s.* Prince Galahad, *d.* V.A.D. *by* The White Knight.

548 III. £5.—CAPT. THE HON. C. K. GREENWAY, Stanbridge Earls, Romsey, Hants., for **Malice 1871**, chestnut, born in 1920, bred by F. J. Balfour, Brierton House, Charlton Kings, Cheltenham; *s.* Malandante, *d.* 5133 Alicia *by* Belsire 655.

550 R.N.—MRS. J. OSCAR MUNTZ, Foxhams, Horrabridge, Devon, for **Early Love.**

Class 57.—*Polo and Riding Pony Colts, Fillies or Geldings, born in* 1933.

558 I. £20.—MRS. J. OSCAR MUNTZ, Foxhams, Horrabridge, Devon, for **Silver Bay** (Supp. 1933), bay filly; *s.* Lovesong 1065, *d.* 5224 Early Market *by* Yorkshire Hussar 813.

559 II. £10.—SIR IAN WALKER, Bart., Osmaston Manor Derby, for **Hitler** (Supp. 1933), chestnut colt; *s.* Tabarin 1682, *d.* Rochette (A.M.R. p. 377) *by* Amadis.

556 III. £5.—MISS B. G. CORY-WRIGHT, Norcott Hill, Berkhamsted, for **Golden Eaglet** (Y.S.R., p. 157), chestnut colt; *s.* Gold Eagle (Y.S.R., p. 36), *d.* Harietta (A.M.R., p. 317) *by* Sir Harry.

560 R.N.—MRS. CONSTANCE BARROW YOUNG, Huish, Basingstoke, for **Confidence 2nd.**

Class 58.—*Polo and Riding Pony Colts, Fillies or Geldings, born in* 1932.

563 I. £20 & R.N. for Champion.[2]—CAPT. W. H. FRANCE-HAYHURST, Bostock Hall, Middlewich, for **Rosina 2nd** (Supp. 1932), chestnut filly; *s.* Silverdale Loyalty 1448, *d.* 6026 Rosine *by* Rosewood 1814.

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[1] Champion Gold Medal given by the National Pony Society for the best Stallion or Colt.
[2] Champion Silver Medal given by the National Pony Society for the best Filly.

562 II. £10.—H. W. CHARRINGTON, The Hut, Fryerning, Ingatestone, for **Old Gold** (Y.S.R., p. 127), chestnut gelding, bred by Tresham Gilbey, Whitehall, Bishop's Stortford; *s.* Bridgewater, *d.* Miss Rich (A.M.R., p. 235).

564 III. £5.—MRS. J. OSCAR MUNTZ, Foxhams, Horrabridge, Devon, for **Glowing Dawn** (Supp. 1932), brown filly; *s.* Lovesong 1065, *d.* 5224 Early Market *by* Yorkshire Hussar 813.

561 R.N.—H. BRIGHT, The Cove, Silverdale, Carnforth, for **Silverdale Aquarelle.**

Class 59.—*Polo and Riding Pony Fillies or Geldings, born in* 1931.

569 I. £20 & Champion.[1]—CAPT. THE HON. C. K. GREENWAY, Stanbridge Earls, Romsey, Hants., for **Malanya** (Supp. 1931), chestnut filly); *s.* Malice 1371, *d.* Elmelha (late Evelyn) (A.M.R., p. 304).

567 II. £10.—MISS B. G. CORY-WRIGHT, Northcott Hill, Berkhamsted, for **Harrier** (Y.S.R., p. 139), chestnut gelding; *s.* Gold Eagle (Y.S.R., p. 36), *d.* Harietta (A.M.R., p. 317), *by* Sir Harry.

568 III. £5.—CAPT. W. H. FRANCE-HAYHURST, Bostock Hall, Middlewich, for **Sunshine 6th** (Supp. 1931), chestnut filly; *s.* Silverdale Loyalty 1448, *d.* 4900 Coronet *by* Little Corona 814.

570 R.N.—SIR IAN WALKER, BART., Osmaston Manor, Derby, for **Fly by Night.**

Class 60.—*Polo and Riding Pony Mares with their own foals at foot, not exceeding* 15 *hands.*

571 I. £20 & Champion.[2]—MISS B. G. CORY-WRIGHT, Norcott Hill, Berkhamsted, for **Falloch Asthore** (A.M.R., p. 193), chestnut, born in 1922 [foal *by* Purple Shade], bred by Mrs. M. Hughes, Ireland; *s.* Count Anthony, *d.* Gay Falloch *by* Gay Man.

572 II. £10 & R.N. for Champion[2] & R.N. for Champion.[3]—CAPT. W. H. FRANCE-HAYHURST, Bostock Hall, Middlewich, for **6026 Rosine**, chestnut, born in 1925 [foal *by* Four Up]; *s.* Rosewood 1314, *d.* 5032 Juliet 2nd *by* Sandiway 121.

573 III. £5.—TRESHAM GILBEY, Whitehall, Bishops Stortford, for **Fanny Freckles** (Supp. 1927), born in 1927, bay [foal *by* Bridgewater], bred by the late Capt. Claude W. Hemp, Bolney Grange, Bolney, Sussex; *s.* Wild Tint 1207, *d.* Funny Face (Supp. 1918) *by* Marzio.

574 R.N. & Champion.[3]—CAPT. THE HON. C. K. GREENWAY, Stanbridge Earls, Romsey Hants.

Arabs.

Class 61.—*Arab Stallions, born in or before* 1930.[4]

576 I. £15.—C. W. HOUGH, Hydes, Abridge, Essex, for **Akal**, grey, born in 1928; *s.* Shelook, *d.* Almas *by* Nuri Pasha.

577 II. £10.—BRIG.-GEN. F. F. LANCE, Wentfield, Wrotham, Kent, for **Kataf**, chestnut, born in 1928; *s.* Outlaw, *d.* Kateefah *by* Uns-el-Wujood.

578 III. £5.—CAPT. THE HON. G. SAVILE, Ditton Lodge, Thames Ditton, Surrey, for **Jiddan** (Vol. 4, p. 49), bay, born in 1930; *s.* Sher-i-Khurshid, *d.* Baida *by* Zoowar.

575 R.N.—H. V. MUSGRAVE CLARK, Courthouse, Offham, Lewes, for **Shadrach.**

Class 62.—*Arab Stallions or Colts, born in* 1931, 1932, *or* 1933.

580 I. £15.—LADY A. H. YULE, Hanstead House, Bricket Wood, St. Albans, for **Kehelan**, chestnut, born in 1932; *s.* Akal, *d.* Razina *by* Champion Rasim.

Class 63.—*Arab Fillies, born in* 1931, 1932, *or* 1933.

586 I. £15.—LADY A. H. YULE, Hanstead House, Bricket Wood, St. Albans, for **Wahine**, bay, born in 1931; *s.* Joseph, *d.* Razina *by* Champion Rasim.

583 II. £10.—BRIG.-GEN. F. F. LANCE, Wentfield, Wrotham, Kent, for **Shthora**, chestnut, born in 1931; *s.* Outlaw, *d.* Zahle *by* Crosbie.

581 III. £5.—H. V. MUSGRAVE CLARK, Courthouse, Offham, Lewes, for **Rahab**, bay, born in 1931; *s.* Sainfoin, *d.* Rangha *by* Berk.

584 R.N.—LADY A. H. YULE, for **Tazee.**

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[1] Champion Silver Medal given by the National Pony Society for the best Filly.
[2] Champion Gold Medal given by the National Pony Society for the best Mare or Filly.
[3] Bronze Medal given by the National Pony Society for the best Foal in Class 60 entered in the Supplement to the National Pony Stud Book.
[4] Prizes given by the Arab Horse Society.

Riding Classes.

Hunters.

Class 66.—*Hunter Mares or Geldings, born in* 1930.

601 I. £15.—J. V. Rank, Ouborough, Godstone, Surrey, for **Senegand**, bay gelding.
593 II. £10.—J. Reg. Hindley, Moorlands, Blacko, Nelson, for **Bradbury**, bay gelding.
646 III. £5.—Mrs. Selkirk Wells, Durwards Hall, Witham, for **Cloverhill**, bay gelding.
605 IV. £3.—J. Pares Wilson, The Manor House, Little Shelford, Cambridge, for **Grassmead**, chestnut mare.
587 R.N.—Sir John W. Buchanan-Jardine of Castlemilk, Bart., Castlemilk, Lockerbie, for **Harmony 7th**, bay mare.
H.C.—599, 634.

Class 67.—*Hunter Mares or Geldings (Novice), born in or before* 1930, *up to from* 12 *to* 14 *stones.*

610 I. £15.—C. S. Drabble, Maynes Hill, Hoggeston, Bletchley, for **Mayfly**, brown gelding, born in 1928.
628 II. £10.—W. J. Smith, Ltd., 21 Little Cadogan Place, London, S.W., for **Matador**, chestnut gelding.
619 III. £5.—Geoff Kenyon, Armscote, Stratford-on-Avon, for **The Curate**, chestnut gelding, born in 1929.
626 IV. £3.—Mrs. G. B. Rowan-Hamilton, Montalto, Ballynahinch, Co. Down, for **Strike a Light**, grey gelding, born in 1929.
616 R.N.—Miss Sybil Harker, Blofield Hall, Norwich, for **Donovan**.
H.C.—587, 605.

Class 68.—*Hunter Mares or Geldings (Novice), born in or before* 1930, *up to more than* 14 *stones.*

639 I. £15.—John Towler, Tunbridge Hall, Bottisham, Cambs., for **The Tide**, bay gelding, born in 1928.

Class 69.—*Hunter Mares or Geldings, born in or before* 1929, *up to not more than* 14 *stones, suitable to carry a lady, and to be ridden by a lady, side-saddle.*

603 I. £15.—J. V. Rank, Ouborough, Godstone, Surrey, for **Waterloo**, bay gelding, born in 1927.
595 II. £10.—J. Reg. Hindley, Moorlands, Blacko, Nelson, for **Bally Martin**, bay gelding, born in 1929.
613 III. £5.—Capt. R. Macdonald-Buchanan, Guilsborough Hall, Northampton, for **Mr. Brinton**, chestnut gelding, born in 1926.
616 IV. £3.—Miss Sybil Harker, Blofield Hall, Norwich, for **Donovan**, brown gelding, born in 1928.
618 R.N.—George Jackson, Wychbold Court, Droitwich, for **Red Shadow**.
H.C.—627.

Class 70.—*Hunter Mares or Geldings, born in or before* 1930, *up to from* 12 *to* 13.7 *stones.*

650 I. £20 & R.N. for Champion.[1]—Mrs. E. M. Vaughan, Blackladies, Brewood, Stafford, for **Goldmint**, chestnut mare, born in 1928.
603 II. £15.—J. V. Rank, for **Waterloo**. (See Class 69.)
647 III. £10.—Major J. F. Harrison, King's Walden Bury, Hitchin, for **Leprecaun**, bay gelding, born in 1926.
613 IV. £5.—Capt. R. Macdonald-Buchanan, for **Mr. Brinton**. (See Class 69.)
610 V. £3.—C. S. Drabble, for **Mayfly**. (See Class 67.)
628 R.N.—W. J. Smith, Ltd., for **Matador**. (See Class 67.)
H.C.—616, 619.

Class 71.—*Hunter Mares or Geldings, born in or before* 1930, *up to more than* 13.7 *and not more than* 15 *stones.*

620 I. £20.—Geoff Kenyon, Armscote, Stratford-on-Avon, for **Wood Pecker**, chestnut gelding, born in 1928.
604 II. £15.—J. V. Rank, Ouborough, Godstone, Surrey, for **Cresselly**, chestnut gelding, born in 1928.
646 III. £10.—Mrs. Selkirk Wells for **Cloverhill**. (See Class 66.)
632 IV. £5.—Mrs. Stanley Barratt, Great Westwood, King's Langley, for **Middleham**, brown gelding, born in 1929.
626 V. £3.—Mrs. G. B. Rowan-Hamilton, for **Strike a Light**. (See Class 67.)
605 R.N.—J. Pares Wilson, for **Grassmead**. (See Class 66.)
H.C.—608, 645, 651.

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[1] Perpetual Silver-Gilt Challenge Cup given by ladies and gentlemen interested in Hunters for the best Hunter Mare or Gelding.

Class 72.—*Hunter Mares or Geldings, born in or before* 1930, *up to more than* 15 *stones.*

653 I. £20 & Champion.[1]—GEORGE SCHICHT, Buckhurst Park, Withyham, Sussex, for **John Peel 2nd**, brown gelding, born in 1927.
648 II. £15.—MAJOR J. F. HARRISON, King's Walden Bury, Hitchin, for **Sherry**, chestnut gelding, born in 1926.
621 III. £10.—GEOFF KENYON, Armscote, Stratford-on-Avon, for **James Pigg**, brown gelding, born in 1927.
639 IV. £5.—JOHN TOWLER, for **The Tide**. (See Class 68.)
597 V. £3.—J. REG. HINDLEY, Moorlands, Blacko, Nelson, for **Golden Rain**, chestnut gelding, born in 1928.

HACKS.

Class 73.—*Hack Mares or Geldings.*

662 I. £15 & Champion.[2]—LT.-COL. SIR ARCHIBALD WEIGALL, K.C.M.G., Englemere, Ascot, for **Radiant**, bay gelding, born in 1925.
624 II. £10 & R.N. for Champion.[2]—MISS PEGGY PACEY, Clifton Hall, Rugby, for **Snapdragon**, bay gelding, born in 1923.
659 III. £5.—CAPT. J. E. HANCE, The Equitation School, Malvern, for **Ecstacy**, brown gelding, born in 1926.
661 IV. £3.—THE DOWAGER LADY PENRHYN, Wicken Park, Bletchley, for **Golden Gleam**, chestnut mare, born in 1928.
660 R.N.—B. W. G. OATES, Alton Hall, Holbrook, Suffolk, for **Honey Bee**.

Class 74.—*Hack Mares or Geldings, suitable to carry a lady and to be ridden by a lady side-saddle.*

662 I. £15.—LT.-COL. SIR ARCHIBALD WEIGALL, K.C.M.G., for **Radiant**. (See Class 73.)
624 II. £10.—MISS PEGGY PACEY, for **Snapdragon**. (See Class 73.)
659 III. £5.—CAPT. J. E. HANCE, for **Ecstacy**. (See Class 73.)
661 IV. £3.—THE DOWAGER LADY PENRHYN, for **Golden Gleam**. (See Class 73.)

CHILDREN'S PONIES.

Class 75.—*Pony Mares or Geldings, not exceeding* 13 *hands, to be ridden by children born in or after* 1924.

668 I. £10.—ANDREW MASSARELLA, Belmont, Bentley, Doncaster, for **Steel Dust**, grey gelding.
674 II. £5.—MASTER ALAN STROYAN, Park Hill, Sunningdale, Berks., for **Quicksilver**, grey mare.
664 III. £3.—MRS. W. W. BOULTON, Braxted Park, Witham, for **Mumtaz Mahal**, grey mare, aged.
667 R.N.—MRS. M. V. HUGHES, Dingley Lodge, Market Harborough, for **Zara**.
H.C.—669.

Class 76.—*Pony Mares or Geldings, over* 13 *and not exceeding* 14 *hands, to be ridden by children born in or after* 1921.

680 I. £10.—MISS MONICA DUNNE, Gatley Park, Kingsland, Herefordshire, for **Goldflake**, chestnut mare, born in 1927.
682 II. £5.—MRS. M. V. HUGHES, Dingley Lodge, Market Harborough, for **Delilah**, brown mare, born in 1927.
684 III. £3.—MISS PAMELA SCRIMGEOUR, Brandeston Hall, Woodbridge, for **Greenfly**, bay mare.
683 R.N.—MISS VIVIEN LUSH, Little Court, Oxted, for **Golden Wonder**.
H.C.—678.

Class 77.—*Pony Mares or Geldings, over* 14 *and not exceeding* 15 *hands, to be ridden by children born in or after* 1918.

624 I. £10.—MISS PEGGY PACEY, for **Snapdragon**. (See Class 73.)
693 II. £5.—MRS. M. V. HUGHES, Dingley Lodge, Market Harborough, for **Ask Papa**, bay gelding, born in 1929.
696 III. £3.—MASTER TONY STUBBING, Went House, West Malling, Kent, for **Primula**, grey mare, born in 1928.
690 R.N.—MISS MADELEINE GRIFFITH, Little Hallingbury Park, Bishop's Stortford, for **Astraea**.
H.C.—694.

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[1] Perpetual Silver-Gilt Challenge Cup given by ladies and gentlemen interested in Hunters for the best Hunter Mare or Gelding.
[2] Silver Challenge Cup given by a Member of R.A.S.E. for the best Hack.

Driving Classes.

Single Harness.

Class 78.—*Stallions, Mares or Geldings (Novice), not exceeding* 14 *hands.*

707 I. £15.—Mrs. Edgar Henriques, Fernholm, Hesketh Park, Southport, for **Fleetwood Zephyr,** bay mare, born in 1929.
725 II. £10.—Douglas T. Slark, Manor Hackney Farms, St. Catherine's, Canada, for **Happy** G. 860, bay gelding, born in 1930.
704 III. £5.—Mrs. J. W. Barclay, Ponds Farm, Galleywood, Chelmsford, for **Galleywood Lady Moon,** bay mare, born in 1929.
717 R.N.—Frank C. Minoprio, Broadlands, Ascot, for **Milly Mouse.**
C.—712, 722.

Class 79.—*Stallions, Mares or Geldings (Novice), over* 14 *and not exceeding* 15 *hands.*

726 I. £15.—J. E. Rushworth, Eskdale, Bargate, Grimsby, for **Habrough Searchlight,** bay gelding, born in 1927.
713 II. £10.—Paul Hoffman, 4, Cardigan Mansions, Richmond Hill, Surrey, for **Modern Miss,** bay mare, born in 1927.

Class 80.—*Stallions, Mares or Geldings (Novice), over* 15 *hands.*

714 I. £15.—Paul Hoffman, 4 Cardigan Mansions, Richmond Hill, Surrey, for **Orford Tradition,** chestnut gelding, born in 1927.
698 II. £10.—Bertram W. Mills, Pollards Wood, Chalfont St. Giles, Bucks., for **Knight of the Bath,** black gelding, born in 1928.

Class 81.—*Stallions, Mares or Geldings, not exceeding* 13.2 *hands.*

701 I. £15.—Walter Briggs, Linden Hall, Borwick, Carnforth, for **Barcroft Belle,** bay mare, born in 1927.
716 II. £10.—Paul Hoffman, 4, Cardigan Mansions, Richmond Hill, Surrey, for **Orford Caprice,** dark brown mare, born in 1926.
727 III. £5.—Mrs. G. Bower, Priory Farm, Fressingfield, Diss, for **Blairavon Venus,** brown mare.
725 R.N.—Douglas T. Slark, for **Happy.** (See Class 78.)
H.C.—704. C.—717, 722.

Class 82.—*Stallions, Mares or Geldings, over* 13.2 *and not exceeding* 14 *hands.*

702 I. £15.—Robert H. McColl, 9 Sherbrook Avenue, Pollokshields, Glasgow, for **Braishfield Sonnet,** chestnut mare.
718 II. £10.—Frank C. Minoprio, Brooklands, Ascot, for **Mickey Mouse,** G. 737, bay gelding, born in 1927.
712 III. £5.—Paul Hoffman, 4 Cardigan Mansions, Richmond Hill, Surrey, for **Orford Belle (late Blairavon Belle),** dark brown mare, born in 1927.

Class 83.—*Stallions, Mares or Geldings, over* 14 *and not exceeding* 15 *hands.*

710 I. £15.—Mrs. Edgar Henriques, Fernholm, Hesketh Park, Southport, for **Fleetwood Nanette,** chestnut mare, born in 1925.
726 II. £10.—J. E. Rushworth, for **Habrough Searchlight.** (See Class 79.)
713 III. £5.—Paul Hoffman, for **Modern Miss.** (See Class 79.)

Class 84.—*Stallions, Mares or Geldings, over* 15 *hands.*

711 I. £15.—Mrs. Edgar Henriques, Fernholm, Hesketh Park, Southport, for **Fleetwood Viking,** brown stallion, born in 1929.
724 II. £10.—Joseph Morton, Dail House, Downham Market, for **Vitality,** chestnut mare, born in 1926.
728 III. £5.—Mrs. G. Bower, Priory Farm, Fressingfield, Diss, for **Taormina,** chestnut mare.
719 R.N.—Frank C. Minoprio, Broadlands, Ascot, for **Pollux.**
H.C.—714.

Double Harness.

Class 85.—*Pairs of Stallions, Mares or Geldings.*

698 & 699 I. £15.—Bertram W. Mills, for **Knight of the Bath** (see Class 80), and **Knight of the Thistle,** black gelding, born in 1924.
707 & 709 II. £10.—Mrs. Edgar Henriques, for **Fleetwood Zephyr** (see Class 78) and **Fleetwood Golden Rain,** bay mare, born in 1928.
712 & 716 III. £5.—Paul Hoffman, for **Orford Belle** (see Class 82), and **Orford Caprice.** (See Class 81.)

TANDEM.

Class 86.—*Stallions, Mares or Geldings.*

698 & 699 I. £15.—BERTRAM W. MILLS, for **Knight of the Bath** (see Class 80) and **Knight of the Thistle** (see Class 85).
707 & 709 II. £10.—MRS. EDGAR HENRIQUES, for **Fleetwood Zephyr** (see Class 78) and **Fleetwood Golden Rain** (see Class 85).
718 & 721 III. £5.—FRANK C. MINOPRIO, for **Mickey Mouse** (see Class 82) and **A.I.'s Fireboy G. 851**, bay gelding, aged.
712 & 716 R.N.—PAUL HOFFMAN, for **Orford Belle** and **Orford Caprice.**

CATTLE.

Unless otherwise stated the Prizes in each Class for Cattle are as follows: First Prize, £15; Second Prize, £10; Third Prize, £5; Fourth Prize, £4; Fifth Prize, £3.

Shorthorns.

Class 87.—*Shorthorn Bulls, born in or before* 1931.

800 I.—J. BAIRD & CO. (FALKIRK), LTD., Bantaskin, Falkirk, for **Crieffvechter Desperado 249960**, white, born May 30, 1931, bred by W. D. Dron, Crieffvechter, Crieff; *s.* Aldie Air Raid 227618, *d.* 2385 Jessica *by* Gloaming Star 136732.
802 II.—THE BAPTON SHORTHORN CO., LTD., Bapton Manor, Warminster, for **Corston Notable 249922**, red, born April 25, 1931, bred by T. A. Buttar, Corston, Coupar Angus; *s.* Balnakyle Sentinel 228036, *d.* 105650 Corston Bellona 14th *by* Balcairn Gold Nugget 218112.
804 III.—SIR BERNARD GREENWELL, Bart., Marden Park, Woldingham, Surrey, for **Marden Eagle 252258**, white, born Jan. 23, 1931; *s.* Walshford Field Marshal 234196 *d.* 80903 Godinton Orphan 8th *by* Balcairn Eagle 168680.
807 R.N.—W. B. SHELTON & SON, Holme Pierrepont, Nottingham, for **Holmepierrepont Baron.**
804, 846, 854 R.N. for Specials.[1]—SIR BERNARD GREENWELL, Bart., for **Marden Eagle, Marden Quartermaster 2nd** and **Marden Myrtle 6th.**

Class 88.—*Shorthorn Bulls, born on or between January* 1 *and March* 31, 1932.[2]

810 I.—A. J. MARSHALL, Bridgebank, Stranraer, for **Calrossie Clipper Commander 255909**, dark roan, born March 16, bred by Capt. J. MacGillivray, Calrossie, Nigg, Ross-shire; *s.* Collynie Royal Leader 188656, *d.* 110127 Calrossie Clipper Lady *by* Clan Chattan 214467.
808 II.—JOHN BARNES, Aikbank, Wigton, for **Vindictive of Stonelands 260795**, red, born March 30, bred by Norman N. Lee, Stonelands, Arncliffe, Skipton-in-Craven; *s.* Collynie Royal Electron 243081, *d.* 64007 Stonelands Clemency 3rd *by* Millhills Clipper King 192163.
811 III.—DUNCAN M. STEWART, Millhills, Crieff, Perthshire, for **Millhills Opal 258806**, white, born Jan. 18; *s.* Elmley Golden Rain 230028, *d.* 79935 Millhills Lavender 5th *by* Collynie Royal Cup 188655.
812 R.N.—CAPT. R. G. M. WILSON, Lady Margaret Road, Cambridge, for **Iceni Golden Orange.**

Class 89.—*Shorthorn Bulls, born on or between April* 1 *and December* 31, 1932.

820 I. & Champion[3] & R.N for Champion.[4]—A. J. MARSHALL, Bridgebank, Stranraer, for **Cruggleton Beverley 256591**, dark roan, born Aug. 28; *s.* Cruggleton Colonel 236411, *d.* 120952 Brenda Blythesome *by* Balcairn Celt 220695
815 II. & R.N. for Champion.[4]—THE BAPTON SHORTHORN CO., LTD., Bapton Manor, Warminster, for **Bapton Royal Robin 255311**, red, born Sept. 8; *s.* Calrossie Ringleader 235690, *d.* 106147 Bapton Princess Royal 9th *by* Roan Robin 202241.
822 III. A. J. MARSHALL, for **Cruggleton Prince Howard 256690**, roan, born June 6; *s.* Cruggleton Prince Henry 236481, *d.* 131183 Princess Clovelly *by* Bridgebank Rosedene 213883.

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[1] Special Prizes of £15 First Prize and £10 Second Prize given by the Shorthorn Society for the best groups of three animals bred by Exhibitor.
[2] Prizes given by the Shorthorn Society.
[3] Champion Prize of £20 given by the Shorthorn Society for the best Bull. A Silver Medal was given by the Shorthorn Society to the Breeder of the Champion Bull.
[4] The "Brothers Colling" Memorial Perpetual Challenge Cup presented through the Durham Agricultural Committee for the best Shorthorn.

818 R.N.—PETER FORBES JONES, Dunmore Park, Dunmore, for **Larbert Clipper King.**
C.—825.

815, 829, 858 Special I.[1]—THE BAPTON SHORTHORN CO., LTD., for **Bapton Royal Robin, Bapton Crocus Leader** and **Bapton Princess Royal 11th.**

820, 822, 833 Special II.[1]—A. J. MARSHALL, for **Cruggleton Beverley, Cruggleton Prince Howard** and **Cruggleton Aurelian.**

Class 90.—*Shorthorn Bulls, born on or between January* 1 *and March* 31, 1933.[2]

829 I.—THE BAPTON SHORTHORN CO., LTD., Bapton Manor, Warminster, for **Bapton Crocus Leader** 261766, red, born March 25; *s.* Calrossie Ringleader 235690, *d.* 116718 Bapton Crocus 13th *by* Roan Robin 202241.

834 II.—W. MCNAIR SNADDEN, The Coldoch, Blair Drummond, Stirling, for **Collynie Magnet** 262800, roan, born Feb. 24, bred by J. Duthie Webster, Collynie, Tarves, Aberdeenshire; *s.* Lenton Knight 231535, *d.* 144420 Collynie Mabel 3rd *by* Baron Nonsuch 196111.

833 III.—A. J. MARSHALL, Bridgebank, Stranraer, for **Cruggleton Aurelian** 262993, dark roan, born Jan. 9; *s.* Bridgebank Rosedene 213883, *d.* 110487 Augusta Gretta *by* Lutwyche Grafter 209357.

827 R.N.—HIS MAJESTY THE KING, The Royal Farms, Windsor, for **Cluny Brestplate.**

Class 91.—*Shorthorn Bulls, born on or between April* 1 *and June* 30, 1933.

836 I.—THE BAPTON SHORTHORN CO., LTD., Bapton Manor, Warminster, for **Bapton Authority** 261757, white, born April 5; *s.* Calrossie Ringleader 235690, *d.* 116714 Bapton Augusta 5th *by* Roan Robin 202241.

II.—J. BAIRD & CO. (FALKIRK) LTD., Bantaskin, Falkirk, for **Aldie Air Ace** 261820, dark roan, born April 25, bred by F. MacGillivray, Aldie, Tain, Ross-shire; *s.* Calrossie Satisfaction 249387, *d.* 64886 Nan Dorothy *by* Calrossie White Prince 179192.

842 III.—A. J. MARSHALL, Bridgebank, Stranraer, for **Rodosto** 266326, red roan, born April 6, bred by James Durno, Uppermill, Tarves; *s.* Glastullich Watchman 237380, *d.* 84836 Rosewood Princess 2nd *by* Millhills Clarion 174123.

841 R.N.—PETER FORBES JONES, Dunmore Park, Dunmore, Stirlingshire, for **Glastullich Pedigree.**
H.C.—840.

Class 92.—*Shorthorn Bulls, born on or between July* 1 *and December* 31, 1933.[2]

846 I.—SIR BERNARD GREENWELL, Bart., Marden Park, Woldingham, Surrey, for **Marden Quartermaster 2nd** 265165, dark roan, born Sept. 25; *s.* Marden Eagle 252258, *d.* 63488 Blythesome 45th *by* Quartermaster 132925.

847 II.—H. & F. B. HIRSCH, Low Hall, Dacre, Harrogate, for **Dacre Valiant** 263155, red, born Aug. 11; *s.* Collynie Royal Electron 248081, *d.* 139415 Dacre Clipper Maiden 10th *by* Rothiebrisbane Bulwark 202379.

848 R.N.—W. B. SHELTON & SON, Holme Pierrepont, Nottingham, for **Holmepierrepont Martinet.**

Class 93.—*Shorthorn Cows, in-milk, born in or before* 1930.

850 I.—THE BAPTON SHORTHORN CO. LTD., Bapton Manor, Warminster, for 83797 **Bapton Princess Royal 3rd**, red, born May 10, 1926, calved April 24, 1934, bred by Sir Cecil Chubb, Bart., Bapton Manor; *s.* Cluny Prince Regent 179639, *d.* 44438 Princess Margaret *by* Billington Snowstorm 154027.

852 II.—CAPT. R. G. M. WILSON, Lady Margaret Road, Cambridge, for 119542 **Arngask Broadhooks 18th**, roan, born March 16, 1929, calved Feb. 7, 1934, bred by William C. Hunter, Arngask, Glenfarg, Perthshire; *s.* Naemoor Gladiator 192867, *d.* 75252 Arngask Broadhooks 13th *by* Gold Reserve 190128.

Class 94.—*Shorthorn Heifers, in-milk, born in* 1931.

856 I.—W. MCNAIR SNADDEN, The Coldoch, Blair Drummond, Stirling, for 143325 **Coldoch Rosewood**, red, born April 14, calved Dec. 3, 1933; *s.* Aldie Air Raid 227818, *d.* 65274 Doune Rosewood 6th *by* Kinellar Clarion 156908.

855 II.—G. MEREDYTH HOPE, Basildon Home Farm, Pangbourne, for 135352 **Yedingham Mina 12th**, dark roan, born April 1, calved Jan. 25, 1934, bred by F. Allison, Lilac Farm, Yedingham; *s.* Yedingham Warrior 241801, *d.* 70106 Yedingham Mina 2nd *by* Equinox 189562.

854 III.—SIR BERNARD GREENWELL, Bart., Marden Park, Woldingham, Surrey, for 138791 **Marden Myrtle 6th**, light roan, born Jan. 21, calved May 3, 1934; *s.* Rosehaugh Champagne 2nd 233158, *d.* 74131 Marden Myrtle 2nd *by* Balcairn Warden 168707.

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[1] Special Prizes of £15 First Prize and £10 Second Prize given by the Shorthorn Society for the best groups of three animals bred by Exhibitor.

[2] Prizes given by the Shorthorn Society.

Class 95.—*Shorthorn Heifers, born in* 1932.

858 **I. Champion**[1] **& Champion.**[2]—The Bapton Shorthorn Co., Ltd., Bapton Manor, Warminster, for 145444 **Bapton Princess Royal 11th**, roan, born Jan. 29; *s.* Calrossie Ringleader 235690, *d.* 83797 Bapton Princess Royal 3rd *by* Cluny Prince Regent 179639.

857 **II.**—His Majesty The King, The Royal Farms, Windsor, for 145105 **Windsor Brawith Bud 3rd**, red, born April 28; *s.* Calrossie Leader's Lad 235685, *d.* 104188 Windsor Betty *by* Calcairn Prince Charming 197792.

862 **III.**—Duncan M. Stewart, Millhills, Crieff, Perthshire, for 153187 **Cherrywood 4th**, white, born April 5; *s.* Royal Defiance 240020, *d.* 102326 Cherrywood 3rd *by* Naemoor Ironclad 209846.

865 **R.N.**—Capt. R. G. M. Wilson, Lady Margaret Road, Cambridge, for **Iceni Eliza 2nd.**
H.C.—859.

Class 96.—*Shorthorn Heifers, born on or between January* 1 *and March* 31, 1933.

866 **I. & R.N. for Champion.**[2]—The Bapton Shorthorn Co., Ltd., Bapton Manor, Warminster, for 155104 **Bapton Blythesome 3rd**, roan, born March 24; *s.* Larbert Baron 251897, *d.* 106134 Bapton Blythesome *by* Rothiebrisbane Bulwark 202379.

873 **II.**—Duncan M. Stewart, Millhills, Crieff, Perthshire, for 157426 **Uppermill Paula**, roan, born Feb. 27, bred by J. Durno, Uppermill, Tarves; *s.* Glastullich Watchman 237380, *d.* 44932 Climsland Paula *by* Clun Nonpareil Choice 170400.

872 **III.**—Duncan M. Stewart, for **Millhills Princess Royal 2nd**, dark roan, born Jan. 3; *s.* Anticur Vice-President 227745, *d.* 89112 Naemoor Princess Royal 3rd *by* Naemoor Gaffer 192364.

867 **R.N.**—H. & F. B. Hirsch, Low Hall, Dacre, Harrogate, for **Dacre Electron Clipper 2nd.**
H.C.—870. **C.**—871.

Class 97.—*Shorthorn Heifers, born on or between April* 1 *and December* 31, 1933.

874 **I.**—The Bapton Shorthorn Co., Ltd., Bapton Manor, Warminster, for 155109 **Bapton Orange Blossom 7th**, dark roan, born April 21; *s.* Calrossie Ringleader 235690, *d.* 116724 Bapton Orange Blossom 3rd *by* Roan Robin 202241.

881 **II.**—Duncan M. Stewart, Millhills, Crieff, Perthshire, for **Millhills Augusta 26th**, red, born April 5; *s.* Anticur Vice President 227745, *d.* 102328 Millhills Augusta 13th *by* Naemoor Ironclad 209846.

882 **III.**—Lady Wills, Coombe Lodge, Blagdon, Bristol, for **Rickford Princess Royal 15th**, red and little white, born April 5; *s.* Collynie Climax 243060, *d.* 114603 Rickford Princess Royal 9th *by* Cudham Prospect 206506.

880 **R.N.**—W McNair Snadden, The Coldoch, Blair Drummond, Stirling, for **Coldoch Rothes Fairy.**
H.C.—878.

Herefords.

Class 98.—*Hereford Bulls, born on or before August* 31, 1931.

885 **I. & R.N. for Champion**[3] **& R.N. for Champion.**[4]—Edward Webb & Sons (Stourbridge), Ltd., Astwood Farm, Stoke Works, Bromsgrove, for **Free Town Counsellor** 50495, born Feb. 11, 1929, bred by P. E. Bradstock, Free Town, Tarrington; *s.* Gaines Albion 45982, *d.* Princess 3rd *by* Aldersend Napier 35844.

883 **II.**—F. J. Newman, Wickton Court, Stoke Prior, Leominster, for **Wickton Oliver**, 51296, born Oct. 20, 1928; *s.* Crossways Emeralute 44726, *d.* Oyster Girl 47th *by* Patchwork 34099.

884 **III.**—David J. Thomas, Monachty, Abergavenny, for **Charlton Midshipman** 53028, born April 3, 1931, bred by J. L. M. Sinnett, Charlton Hill, Wroxeter; *s.* Eyton Vicar 50446, *d.* Charlton Peri 2nd *by* Courageous 36465.

Class 99.—*Hereford Bulls, born on or between September* 1, 1931, *and August* 31, 1932.

889 **I. Champion**[3] **& Champion.**[4]—John Parr, Burton, Ross, Herefordshire, for **Burton Maypole** 55655, born Jan. 24, 1932; *s.* Clive Maypole 50326, *d.* Eaton Kate (Vol. 63, p. 454) *by* Burton Cornerstone 44612.

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[1] The "Brothers Colling" Memorial Perpetual Challenge Cup presented through the Durham Agricultural Committee for the best Shorthorn.

[2] Champion Prize of £20 given by the Shorthorn Society for the best Cow or Heifer. A Silver Medal was given by the Shorthorn Society to the Breeder of the Champion Cow or Heifer.

[3] Champion Prize of £10 10*s.* given by the Hereford Herd Book Society for the best Senior Bull.

[4] Perpetual Silver Challenge Trophy given through the Hereford Herd Book Society for the best Bull.

886 II.—T. L. D. & JOHN H. EVERALL, Sherlowe, Wellington, Shropshire, for **Shrine Fearless** 55186, born Oct. 12, 1931, bred by T. L. D. Everall, Shrawardine, Shrewsbury; *s.* Shradden Knight 53838, *d.* May *by* Resolute 35537.
890 III.—TUDGE & MAYBERY, Whittingslow, Marsh Brook, Shropshire, for **Great Bear** 55992, born Dec. 15, 1931, bred by Col. H. R. Pettit, Castle Weir, Lyonshall, Herefordshire; *s.* Eaton Leo 45890, *d.* Eastern Star *by* Sheikh Nuran 35605.

Class 100.—*Hereford Bulls, born on or between September* 1 *and November* 30, 1932.[1]

894 I. & Champion.[2]—EDWARD WEBB & SONS (STOURBRIDGE), LTD., Astwood Farm, Stoke Works, Bromsgrove, for **Astwood Convoyer** 55495, born Sept. 29; *s.* Free Town Counsellor 50495, *d.* Gobion Oyster Girl *by* Gobion Resolute 46010.
891 II.—W. H. JONES, Brook Farm, Lyonshall, Kington, Herefordshire, for **Freetown Limelight** 55938, born Sept. 7, bred by P. E. Bradstock, Free Town, Tarrington; *s.* Eyton Taurus 49201, *d.* Free Town Trustful *by* Crossways Saphlute 44732.
892 III.—CHARLES HENRY MORRIS, Weston Court, Pembridge, for **Westhide Cator**, born Oct. 6, bred by H. R. Jenkins, Westhide, Hereford; *s.* Free Town Cameronian 53214, *d.* Broom Pearl 2nd *by* Sugwas Roman 51174.

Class 101.—*Hereford Bulls, born on or between December* 1, 1932, *and February* 28, 1933.

897 I. & R.N. for Champion.[2]—H. R. GRIFFITHS, Little Tarrington, Herefordshire, for **Tarrington Sun God** 56560, born Jan. 28, 1933; *s.* Tarrington Sports Model 53924, *d.* Splendour *by* Free Town Director 49237.
895 II.—PERCY E. BRADSTOCK, Free Town, Tarrington, Hereford, for **Penmaes Enterprise** 56334, born Jan. 7, 1933, bred by J. Pryce & Sons, Penmaes, Talgarth; *s.* Glenside 48192, *d.* Constance *by* Leen Marlpot 37179.
899 III.—MORGAN T. JONES, Sugwas Farm, Hereford, for **Sugwas Corrector**, born Jan. 31, 1933; *s.* Leap Year 50680, *d.* Sugwas Fanny *by* Rose Wilfred 49757.

Class 102.—*Hereford Bulls, born on or after March* 1, 1933.

906 I.—MAJOR J. N. RITCHIE, Tern, Wellington, Shropshire, for **Tern Gauntlet** 56572, born April, 18, 1933; *s.* Lydham Merrylute 50727, *d.* Tern Coral *by* Burton Showman 46873.
902 II.—H. R. GRIFFITHS, Little Tarrington, Herefordshire, for **Tarrington Dexterous** 56554, born March 30, 1933; *s.* Efton Taurus 49201, *d.* Dewdrop *by* Gaines Albion 45982.
905 III.—JOHN PARR, Burton, Ross, Herefordshire, for **Burton Rareman**, born May 31, 1933; *s.* Burton Lux 52961, *d.* Thickset *by* Bounds Ironclad 36089.
H.C.—900. C.—904.

Class 103.—*Hereford Cows or Heifers, in-milk, born on or before August* 31, 1931.

909 I. & Champion.[3]—H. R. GRIFFITHS, Little Tarrington, Herefordshire, for **Britannia** (Vol. 62, p. 328), born March 6, 1931, calved Dec. 5, 1933; *s.* Tarrington Optimist 49837, *d.* Blue Bell *by* Tarrington Marquis 45453.
908 II.—HIS MAJESTY THE KING, The Royal Farms, Windsor, for **Windsor Elsie** (Vol. 62. p. 182), born Nov. 11, 1930, calved Jan. 2, 1934; *s.* Free Town Valors 48171, *d.* Envy *by* Admiral Beatty 31222.

Class 104.—*Hereford Heifers, born on or between September* 1, 1931, *and August* 31, 1932.

911 I.—W. H. JONES, Brook Farm, Lyonshall, Kington, Herefordshire, for **Blue Bird** (Vol. 63, p. 359), born Feb. 22, 1932; *s.* Rightful Rosecross 51077, *d.* Blue Bell *by* Royal Marine 30992.

Class 106.—*Hereford Heifers, born on or after December* 1, 1932.

912 I. & R.N. for Champion.[3]—T. L. D. EVERALL Shrawardine Castle, Shrewsbury, for **Shraden Rarity 10th**, born Dec. 5, 1932, bred by W. Everall, Shrewsbury; *s.* Pertonlute 50945, *d.* Miss Rarity 2nd (Vol. 61, p. 283) *by* Double Crown 36582.
913 II.—MAJOR J. N. RITCHIE, Tern, Wellington, Shropshire, for **Tern Ivy Queen 2nd**, born Jan. 7, 1933; *s.* Lydham Merrylute 50727, *d.* Russell Ivy Queen (Vol. 63, p. 515) *by* Democrat of Pitsford 38987.

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[1] Prizes given by the Hereford Herd Book Society.
[2] Champion Prize of £10 10*s.* given by the Hereford Herd Book Society for the best Junior Bull.
[3] Champion Prize of £10 10*s.* given by the Hereford Herd Book Society for the best Cow or Heifer.

Devons.

Class 107.—*Devon Bulls, born in or before* 1932.

917 **I. & R.N. for Champion.**[1]—GEORGE WEBBER, Crazelowman, Tiverton, for **Halsdon Best Man** 15781, born Feb. 10, 1931, bred by Abraham Trible, Halsdon, Holsworthy; *s.* Nerrols Best Man 12374, *d.* Kingsford Fancy 39811 *by* Roadwater Goldfinder 10738.

914 **II.**—MARK BRITTON, Rowridge, Tiverton, for **Rowridge Venture** 15032, born Nov. 11, 1929; *s.* Greenend Perfection 12276, *d.* Myrtle 17453 *by* Clinker 11390.

918 **III.**—A. M. WILLIAMS, Werrington Park, Launceston, for **Lee Thick 'Un** 15784, born March 12, 1931, bred by Fred Allin, Lee Barton, Kilkhampton, Cornwall; *s.* Duke of Pound 14424, *d.* Lee Gay Girl 38836 *by* Gay Boy 12656.

915 **R.N.**—JAMES LEWIS, Kensington, Washfield, Tiverton, for **Kittisford Noble.**

Class 108.—*Devon Bulls, born in* 1933.

922 **I. & Champion.**[1]—A. M. WILLIAMS, Werrington Park, Launceston, for **Climsland Masterstroke** 16403, born Jan. 2, bred by H.R.H. The Prince of Wales, K.G., Stoke Climsland; *s.* Coombeshead Monarch 14801, *d.* Crazelowman Vanity 35826 *by* Lolworth Mountaineer 11104.

919 **II.**—G. C. ALEXANDER, Winterbourne Stoke, Salisbury, for **Stoke David** 16646, born March 17; *s.* Stoke Glory 13760, *d.* Nerrols Ivy 4th 38797 *by* Norton Hero 12894.

920 **III.**—CECIL BRENT, Clampit, Callington, Cornwall, for **Clampit Goldmine 4th** 16394, born April 5; *s.* Pigsdon Useful 14566, *d.* Clampit Gay Lass 20th 34608 *by* Highfield Gem 8919.

924 **R.N.**—P. M. WILLIAMS, Stowford, Chittlehampton, North Devon, for **Stowey Fascist.**

Class 109.—*Devon Cows or Heifers, in-milk, born in or before* 1931.

926 **I. & Champion.**[2]—CECIL BRENT, Clampit, Callington, Cornwall, for **Clampit Dainty 10th** 41040, born March 31, 1928, calved Sept. 27, 1933; *s.* Pound Romper 12413, *d.* Clampit Dainty 7th 37749 *by* Highfield Gem 8919.

927 **II. & R.N. for Champion.**[2]—CECIL BRENT, for **Clampit Hygiene 10th** 38902, born April 30, 1926, calved May 1, 1934; *s.* Pound Romper 12413, *d.* Clampit Hygiene 7th 34700 *by* Highfield Gem 8919.

929 **III.**—REGINALD SUMMERS, Pookhayne Farm, Southleigh, Colyton, Devon, for **Moonlight 2nd** 46260, born in 1928, calved Dec. 20, 1933, bred by Seth Durbin, Farwood Barton, Colyton; *s.* Prince 12415, *d.* Bryanston Moonlight 29510 *by* Marmion 7452.

Class 110.—*Devon Heifers, born in* 1932.

934 **I.**—CLIFFORD THORNE, Rutland Villa, Maindee, Newport, Mon., for **Clampit Hygiene 16th** 46297, born Feb. 24, bred by Cecil Brent, Clampit, Callington; *s.* Pigsdon Useful 14566, *d.* Clampit Hygiene 7th 34700 *by* Highfield Gem 8919.

932 **II.**—H. H. BROADMEAD, Enmore Castle, Bridgwater, for **Enmore Marsh Mallow** 45733, born May 8; *s.* Stallengethorne Boxer 10544, *d.* Avercombe Marchioness 37577 *by* Overton Masterpiece 11152.

933 **III.**—REGINALD SUMMERS, Pookhayne Farm, Southleigh, Colyton, Devon, for **Pookhayne Gipsy 1st** 45521, born Jan. 15; *s.* Coryton Old Sort 14389, *d.* Coryton Gipsy 2nd 39199 *by* Coryton Artful 12614.

Class 111.—*Devon Heifers, born in* 1933.

937 **I.**—JAMES LEWIS, Kensington, Washfield, Tiverton, for **Washfield Crocus** 46061, born March 26; *s.* Netherexe Curly Boy 18259, *d.* Warrens Park Dandy 42028 *by* Coombeshead Conjuror 13063.

939 **II.**—A. M. WILLIAMS, Werrington Park, Launceston, for **Werrington Empress 9th** 46874, born March 27; *s.* Lee Thick 'Un 15784, *d.* Werrington Empress 4th 42851 *by* Clampit Goldmine 13045.

935 **III.**—W. G. BRENT, Warrens Park, Congdon Shop, Launceston, for **Warrens Park Dainty** 45718, born Jan. 31; *s.* Pigsdon Useful 14566, *d.* Warrens Park Cone 41055 *by* Coombeshead Conqueror 13063.

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[1] Champion Prize of £10 10*s.* given by the Devon Cattle Breeders' Society for the best Bull.

[2] Champion Prize of £10 10*s.* given by the Devon Cattle Breeders' Society for the best Cow or Heifer.

Sussex.

Class 112.—*Sussex Bulls, born in or before* 1932.

941 I., Champion,[1] Champion [2] & Champion.[3]—EDWARD HURTLEY, Crowborough Warren, Sussex, for **Crowborough Warren Marksman 6th 7200**, born March 14, 1929; *s.* Bolebroke Marksman 14th 6827, *d.* Oakover Daisy 25th 22272 *by* Oakover Chevalier 6th 5610.

943 II.—L. O. JOHNSON, Peppers, Ashurst, Steyning, Sussex, for **Bolebroke Rover 11th** 7703, born Jan. 25, 1932, bred by P. R. Mann, Bolebroke, Hartfield, Sussex; *s.* Crowborough Warren Rover 8th 6998, *d.* Bolebroke Prolific Mary 18204 *by* Burgate James 3630.

944 III.—COL. J. R. WARREN, O.B.E., M.C., The Hyde, Handcross, Haywards Heath, for **Bolebroke Rover 1st** 7411, born April 7, 1930, bred by P. R. Mann, Bolebroke, Hartfield, Sussex; *s.* Crowborough Warren Rover 8th 6998, *d.* Lock Darkey 28th 18388 *by* Birling Geoffrey 2nd 4252.

Class 113.—*Sussex Bulls, born in* 1933.

948 I., R.N. for Champion[1] & R.N. for Champion.[2]—COL. J. R. WARREN, O.B.E., M.C., The Hyde, Handcross, Haywards Heath, for **Handcross Harlequin 7th** 7883, born Jan. 5; *s.* Handcross Harlequin 7303, *d.* Oakover Gipsy 3rd 20897 *by* Chevalier 2nd 3673.

946 II.—EDWARD HURTLEY, Crowborough Warren, Sussex, for **Crowborough Warren Honest 23rd** 7797, born Feb. 20; *s.* Dillions Honest 7050, *d.* Lock Briar 2nd 21914 *by* Jacobite 5116.

945 III.—BRIG.-GEN. G. HOLDSWORTH, C.B., C.M.G., Glynde Place, Glynde, Sussex, for **Caburn Franchise** 7789, born Feb. 1; *s.* Dillions Landlord 7553, *d.* Caburn Beauty 10th 25212 *by* Caburn Diploma 6370.
H.C.—947.

Class 114.—*Sussex Cows or Heifers, in-milk, born in or before* 1931.

950 I. & R.N. for Champion.[4]—L. O. JOHNSON, Peppers, Ashurst, Steyning, Sussex, for **King's Barn Dusky Queen** 25718, born Jan. 5, 1930, calved Jan. 12, 1934; *s.* Petworth Toreador 16th 6802, *d.* King's Barn Dusky 24088 *by* King's Barn Sunbright 6213.

949 II.—BRIG.-GEN. G. HOLDSWORTH, C.B., C.M.G., Glynde Place, Glynde, Sussex, for **Caburn Daisy 7th** 26138, born Jan. 30, calved Jan. 10, 1934; *s.* Caburn Diploma 6370, *d.* Caburn Daisy 1st 22069 *by* Quedley Duke 3rd 5083.

Class 115.—*Sussex Heifers, born in* 1932.

954 I., Champion [4] & R.N. for Champion.[3]—COL. J. R. WARREN, O.B.E., M.C., The Hyde, Handcross, Haywards Heath, for **Wateringbury Farleigh** 26455, born April 17, bred by Osborn Dan, Wateringbury Place, Kent; *s.* King's Barn Duke 7378, *d.* Coombs Farleigh 2nd 24949 *by* Warehouse Golden Miller 6627.

951 II.—BRIG.-GEN. G. HOLDSWORTH, C.B., C.M.G., Glynde Place, Glynde, Sussex, for **Caburn Beauty 17th** 26570, born Jan. 10; *s.* Kennington Marksman 7208, *d.* Caburn Beauty 10th 25212 *by* Caburn Diploma 6370.

952 III.—EDWARD HURTLEY, Crowborough Warren, Sussex for **Crowborough Warren Poppy 3rd** 26602 born Jan. 9; *s.* Crowborough Warren Marksman 6th 7200, *d.* Oakover Poppy 5th 21566 *by* Chevalier 2nd 3673.

Class 116.—*Sussex Heifers, born in* 1933.

958 I.—COL. J. R. WARREN, O.B.E., M.C., The Hyde, Handcross, Haywards Heath, for **Handcross Darkey 6th**, born Jan. 10; *s.* Handcross Harlequin 7303, *d.* Handcross Darkey 3rd 25919 *by* Jacques Court G2 6703.

955 II.—BRIG.-GEN. G. HOLDSWORTH, C.B., C.M.G., Glynde Place, Glynde, Sussex, for **Caburn Darkey 18th**, born March 5; *s.* Caburn Diploma 6370, *d.* Caburn Darkey 2nd 22721 *by* Hermitage King 5629.

956 III.—L. O. JOHNSON, Peppers, Ashurst, Steyning, Sussex, for **King's Barn Carnation**, born Jan. 7; *s.* Crowborough Warren Marksman 16th 7370, *d.* Dillions Carnation 15th 25315 *by* Crowborough Warren Sunburst 6781.
H.C.—959.

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[1] Champion Silver Medal given by the Sussex Herd Book Society for the best Bull.
[2] Perpetual Silver Challenge Trophy given through the Sussex Herd Book Society for the best Bull.
[3] Perpetual Silver Challenge Cup given by the Sussex Cattle Breeders' Society of South Africa for the best Sussex.
[4] Champion Silver Medal given by the Sussex Herd Book Society for the best Cow or Heifer.

Park Cattle (Polled or Horned).

Class 122.—*Park Bulls, born in or before* 1932.

960 I.—THE DUKE OF BEDFORD, K.G., Woburn Abbey, Bletchley, for **Woburn Matthias 28th 501**, born April 13, 1932; *s.* Woburn Matthias 11th 345, *d.* 1174 Woburn Buckingham 30th *by* Woburn Young Chartley 35.

961 II.—THE DUKE OF BEDFORD, K.G., for **Woburn Pykentigern 1st 281**, born April 3, 1926; *s.* Poynetts Kentigern 199, *d.* 703 Woburn Buckingham 16th *by* Woburn Perfection 2nd 89.

962 III.—BUXTON & BIRKBECK, Bolwick Hall Farm, Marsham, Norwich, for **Bolwick Hermes 539**, born Jan. 22, 1931, bred by Sir Roderick Wigan, Bart., Horstead Hall, Norwich; *s.* Horstead Victor 311, *d.* 1582 Horstead Honeysuckle *by* Ranworth Royal Sovereign 321.

963 R.N.—CAPT. C. G. LANCASTER, Kelmarsh Hall, Northampton, for **Kelmarsh Eager.**

Class 123.—*Park Bulls, born in* 1933.[1]

966 I.—BRIG.-GEN. K. KINCAID-SMITH, St. Osyth's Priory, Clacton-on-Sea, for **St. Osyth's Lex**, born Jan. 17; *s.* St. Osyth Friar 395, *d.* 1323 St. Osyth Daisy *by* St. Osyth Rex 133.

965 II.—MAJOR Q. E. GURNEY, Bawdeswell Hall, East Dereham, for **Bawdeswell Swan**, born Dec. 20; *s.* Hemblington Jovial 473, *d.* 1854 Bawdeswell Swansong *by* Bawdeswell Barrister 295.

Class 124.—*Park Cows or Heifers, in-Milk, born in or before* 1931.

971 I.—H. J. CATOR, Ranworth Hall, Norwich, for **1566 Giffords Toplady**, born June 8, 1927, calved March 15, 1934, bred by Col. J. C. Tabor, Trewsbury, Cirencester; *s.* Giffords Rector 245, *d.* 980 Giffords Tip Top *by* Giffords Pluto 243.

973 II.—JOHN CATOR, Woodbastwick Hall, Norwich, for **1658 Woodbastwick Black Pearl 4th**, born April 8, 1928, calved Sept. 30, 1933; *s.* Woodbastwick Vulcan 329, *d.* 1062 Woodbastwick Black Pearl *by* Woodbastwick Petrarch 139.

977 III.—BRIG.-GEN. K. KINCAID-SMITH, St. Osyth's Priory, Clacton-on-Sea, for **1340 St. Osyth Emerald**, born Nov. 5, 1926, calved Nov. 15, 1933; *s.* St. Osyth Rex 133, *d.* 578 Northrepps Lichen *by* Northrepps Woodwick 55.

968 R.N.—THE DUKE OF BEDFORD, K.G., Woburn Abbey, Bletchley, for **Woburn Buckingham 53rd.**
H.C.—969. C.—970.

Class 125.—*Park Heifers, born in* 1932.

981 I.—JOHN CATOR, Woodbastwick Hall, Norwich, for **2300 Woodbastwick Juliet**, born Dec. 30; *s.* Woodbastwick Robin Hood 491, *d.* 806 Woodbastwick Janitress 3rd *by* Bawdeswell Plevna 43.

982 II.—MAJOR Q. E. GURNEY, Bawdeswell Hall, East Dereham, for **2106 Bawdeswell Condor**, born Jan. 18; *s.* Bawdeswell Eland 463, *d.* 1206 Bawdeswell Congress *by* Bawdeswell Leo 163.

983 III.—MAJOR Q. E. GURNEY, for **2114 Bawdeswell Crinoline**, born Feb. 26; *s.* Bawdeswell Eland 463, *d.* 1812 Bawdeswell Constance *by* Ranworth Regal 317.

979 R.N.—THE DUKE OF BEDFORD, K.G., Woburn Abbey, Bletchley, for **Woburn Pyaura 4th.**
H.C.—980. C.—984.

Class 126.—*Park Heifers, born in* 1933.[1]

988 I.—JOHN CATOR, Woodbastwick Hall, Norwich, for **Woodbastwick Joyce 5th**, born Aug. 15; *s.* Woodbastwick Robin Hood 491, *d.* 812 Woodbastwick Joyce *by* Bawdeswell Plevna 43.

990 II.—MAJOR Q. E. GURNEY, Bawdeswell Hall, East Dereham, for **Bawdeswell Pansy**, born Jan. 19; *s.* Bawdeswell Catfish 369, *d.* 1838 Bawdeswell Phyllis 3rd *by* Bolwick Laird 387.

991 III.—BRIG.-GEN. K. KINCAID-SMITH, St. Osyth's Priory, Clacton-on-Sea, for **St. Osyth Lassie**, born March 28; *s.* Giffords Pundit 555, *d.* 1334 St. Osyth Dolly *by* St. Osyth Rex 133.

987 R.N.—H. J. CATOR, Ranworth Hall, Norwich, for **Ranworth Juniper.**
H.C.—986. C.—989.

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[1]Prizes given by the Park Cattle Society.

Longhorns.

Class 127.—*Longhorn Bulls, born in or before* 1932.

995 I. & Champion.[1]—R. S. WALTERS, Norfolk Lodge, Sutton Coldfield, for **Sutton Victor** 948, red, brindle and white, born March 27, 1929; *s.* Arden Final 891, *d.* Lady Violet of Kent *by* Admiral 632.

993 II.—J. W. SWINNERTON-WESTON, Over Whitacre House, Birmingham, for **Whitacre Beau 2nd** 968, brindle white, born July 21, 1931; *s.* Arden Final 891, *d.* Whitacre Beauty 3rd *by* Chippinghurst Greatheart 812.

992 III.—W. E. SWINNERTON, Crickley Barrow House, Northleach, Glos., for **Crickley Duke** 971, red brindle and white, born June 27, 1932; *s.* Crickley Nobleman 954, *d.* Carnation of Chippinghurst *by* Prince Diadem of Kent 778.

994 R.N.—R. S. WALTERS, for **Sutton Spec.**

Class 128.—*Longhorn Bulls, born in* 1933.

997 I. & Champion.[2]—F J MAYO, Friar Waddon, Upwey, Weymouth, for **Waddon Loveboy** 977, red, brindle and white, born Jan. 26; *s.* Sutton Ruler 947, *d.* Waddon Lofty (Vol. 13, p. 14) *by* Chester 810.

996 II.—R. R. HOLLICK, Stivichall Grange, Coventry, for **Finham Victor** 972, brindle and white, born May 16; *s.* Westwood Victor 966, *d.* Finham Princess 5th *by* Sutton Rufus 930.

998 III.—R. S. WALTERS, Norfolk Lodge, Sutton Coldfield, for **Sutton Chere** 974, red, brindle and white, born Jan. 15; *s.* Sutton Victor 948, *d.* Cherub of Chippinghurst *by* Chippinghurst Greatheart 812.

Class 129.—*Longhorn Cows or Heifers, in-milk, born in or before* 1931.

1000 I. & R.N. for Champion.[1]—F. J. MAYO, Friar Waddon, Upwey, Weymouth, for **Friar Pet** (Vol. 17, p. 10), red, brindle and white, born Feb. 6, 1930, calved May 28, 1934; *s.* Friar Larkspur 942, *d.* Friar Pancake 2nd *by* Canley Omega 895.

1004 II.—J. W. SWINNERTON-WESTON, Over Whitacre House, Birmingham, for **Whitacre Sunrise** (Vol. 16, p. 15), red, brindle and white, born July 15, 1928, calved May 28, 1934; *s.* Arden Final 891, *d.* Sunrise of Chippinghurst *by* Chippinghurst Cricket 811.

1002 III.—W. E. SWINNERTON, Crickley Barrow House, Northleach, Glos., for **Friar Sprig 2nd** (Vol. 15, p. 11), red, brindle and white, born June 16, 1927, calved May 25, 1934, bred by F. J. Mayo, Friar Waddon, Weymouth; *s.* Friar Pop 902, *d.* Friar Sprig *by* Aston 725.

1001 R.N.—W. E. SWINNERTON, for **Crickley Dewdrop.**

Class 130.—*Longhorn Heifers, born in* 1932 *or* 1933.

1006 I. & R.N. for Champion.[2]—F. J. MAYO, Friar Waddon, Upwey, Weymouth, for **Friar Tess 2nd**, red, brindle and white, born March 18, 1932; *s.* Friar Bakewell 923, *d.* Friar Tess *by* Canley Omega 895.

1008 II.—R. S. WALTERS, Norfolk Lodge, Sutton Coldfield, for **Sutton Vivi 2nd** (Vol. 18, p. 13), red, brindle and white, born Feb. 29, 1932; *s.* Sutton Victor 948, *d.* Lady Violet of Kent *by* Admiral 632.

1005 III.—R. R. HOLLICK, Stivichall Grange, Coventry, for **Finham Viola 2nd** (Vol. 18, p. 5), brindle and white, born Feb. 20, 1932; *s.* Stoneleigh Select 945, *d.* Finham Viola *by* Arden Dairyman 890.

1007 R.N.—W. E. SWINNERTON, Crickley Barrow House, Northleach, for **Westwood Amy.**

Aberdeen-Angus.

Class 131.—*Aberdeen-Angus Bulls, born on or before November* 30, 1931.

1009 I., Champion,[3] Champion,[4] R.N. for Champion[5] & R.N. for Champion.[6]—VISCOUNT ALLENDALE, Bywell, Stocksfield-on-Tyne, for **Pelorus of Bywell** 78476, born Dec. 18, 1930; *s.* Elurio of Nisbethill 67008, *d.* Primrose of Bywell 77907 *by* Verigood of Bywell 55942.

1010 II.—LADY ROBINSON, Kirklington Hall, Newark, for **Prince Ben of Boghead** 78685, born Feb. 8, 1931, bred by James Duff, Boghead, Huntly, Aberdeenshire; *s.* Geodesy of Bleaton 70819, *d.* Pride 74th of Coynachie 82861 *by* Gleam of Lochbank 54945.

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[1] Perpetual Silver Challenge Cup given by the Longhorn Cattle Society for the best Senior Longhorn.

[2] Perpetual Silver Challenge Cup given by the Longhorn Cattle Society for the best Junior Longhorn.

[3] Perpetual Silver Challenge Trophy given through the Aberdeen-Angus Cattle Society for the best Bull.

[4] Gold Medal given by the English Aberdeen-Angus Cattle Association for the best animal of the opposite sex to that of the animal awarded the Champion Gold Medal of the Aberdeen-Angus Cattle Society.

[5] Champion Gold Medal given by the Aberdeen-Angus Cattle Society for the best Aberdeen-Angus.

[6] Silver Medal given by the English Aberdeen-Angus Cattle Association for the best animal bred in England or Wales.

Class 132.—*Aberdeen-Angus Bulls, born on or between December* 1, 1931, *and November* 30, 1932.

1017 I., R.N. for Champion [1] & R.N. for Champion.[2]—ROBERT MCVITIE GRANT, Logie Home Farm, Dunphail, Forres, Morayshire, for **Gandell** 80993, born Dec. 28, 1931, bred by Sir Edmund Findlay, Bart., Aberlour; *s.* Prince Pride of Duthil 57900, *d.* Gens 69375 *by* Just Eric of Harviestoun 38113.

1019 II.—SIR PRINCE PRINCE-SMITH, Bart., Southburn House, Driffield, for **Ecliptic of Southburn** 80236, born Feb. 8, 1932; *s.* Primary of Dunira 62646, *d.* Eclat of Southburn 85325 *by* Rufus of Buckland 53693.

1015 III.—CAPT. A. L. GOODSON, Kilham, Mindrum, for **Mattock of Bywell** 81644, born Jan. 1, 1932, bred by Viscount Allendale, Bywell, Stocksfield-on-Tyne; *s.* Elurio of Nisbet-hill 67008, *d.* Matuba of Bywell 85932 *by* Erebus of Harviestoun 56780.

1013 R.N.—E. KEITH BROOKS, Coombe Lodge, Thatcham, Berks., for **Elenorist of Ballintomb.**

H.C.—1014, 1021.

Class 133.—*Aberdeen-Angus Bulls, born on or between December* 1, 1932, *and November* 30, 1933.

1022 I.—VISCOUNT ALLENDALE, Bywell, Stocksfield-on-Tyne, for **Jellaba Eric** 84640, born Feb. 21, 1933, bred by J. E. Kerr, Harviestoun, Dollar; *s.* Equipment of the Laws 77121 *d.* Jewel Erica 87333 *by* Guardian of Candacraig 61908.

1025 II.—BARONESS BURTON, Rangemore Hall, Burton-on-Trent, for **Pleideir** 85351, born Jan. 26, 1933, bred by Comdr. J. A. Duncan, Parkhill, Arbroath; *s.* Eblito of Balfron 70096, *d.* Peucag 96311 *by* Evacum of Ballindalloch 59253.

1032 III.—LADY ROBINSON, Kirklington Hall, Newark, for **Kirriemuir of Kirklington** 84843, born Jan. 16, 1933; *s.* Prince Ben of Boghead 78685, *d.* Pride of Glenmoy 92192 *by* Hayston Ideal Ensign 57199.

1031 R.N.—SIR PRINCE PRINCE-SMITH, Bart., Southburn House, Driffield, for **Judicial of Southburn.**

H.C.—1028.

Class 134.—*Aberdeen-Angus Cows or Heifers, in-milk, born on or before November* 30, 1931.

1038 I., Champion [3] & Champion.[4]—LADY ROBINSON, Kirklington Hall, Newark, for **Matchless of Amport** 92174, born Dec. 24, 1928, calved Dec. 6, 1933, bred by Col. Sofer Whitburn, Amport, Andover; *s.* Proud Baladan of The Burn 62756, *d.* Meta of Apethorpe 53824 *by* Exquisite of Ballindalloch 33202.

1035 II.—CAPT. A. L. GOODSON, Kilham, Mindrum, for **Black Friar of Kilham** 96606, born March 1, 1931, calved Feb. 10, 1934; *s.* Embos of Bleaton 56712, *d.* Black Berry of Kilham 90246 *by* Kythe of Dunira 64963.

1036 III.—D. S. GOUGH, Old Hall, Pakenham, Bury St. Edmunds, for **Bond Maid of Banks** 89279, born Dec. 22, 1928, calved Feb. 17, 1934, bred by James Beddie, Banks, Strichen; *s.* Grierson of Ballindalloch 54969, *d.* Beatrix of Pitfour 78485 *by* Evolver of Ballindalloch 50518.

Class 135.—*Aberdeen-Angus Heifers, born on or between December* 1, 1931, *and November* 30, 1932.

1040 I.—WALTER A. SANDEMAN, Morden House, Guilden Morden, Royston, for **Elvina of Morden** 101081, born March 17, 1932; *s.* Jupiter of Belvoir 71187, *d.* Effulgent 2nd of Witley 77109 *by* Mulben Peerless 51074.

1039 II.—D. S. GOUGH, Old Hall, Pakenham, Bury St. Edmunds, for **Mungos Grisildis** 10046, born Dec. 19, 1931, bred by J. P. Ross-Taylor, Mungoswalls, Duns; *s.* Elf of Dunira 73508, *d.* Graceful of Mungoswalls 77283 *by* Evolater of Ballindalloch 50517.

Class 136.—*Aberdeen-Angus Heifers, born on or between December* 1, 1932, *and November* 30, 1933.

1049 I.—D. S. GOUGH, Old Hall, Pakenham, Bury St. Edmunds, for **Idyll 2nd of Gloagburn** 103645, born Dec. 1, 1932, bred by John Niven, Gloagburn, Tibbermore; *s.* Elanet of Bleaton 54419, *d.* Lady Ida 7th of Duthil 73350 *by* Pundit of Moyness 49137.

1053 II.—LADY ROBINSON, Kirklington Hall, Newark, for **Eyebright of Kirklington** 103946, born March 12, 1933; *s.* Prince Ben of Boghead 78685, *d.* Eilenora of Candacraig 88776 *by* Bodouin of Candacraig 58381.

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[1] Perpetual Silver Challenge Trophy given through the Aberdeen-Angus Cattle Society for the best Bull.

[2] Gold Medal given by the English Aberdeen-Angus Cattle Association for the best animal of the opposite sex to that of the animal awarded the Champion Gold Medal of the Aberdeen-Angus Cattle Society.

[3] Champion Gold Medal given by the Aberdeen-Angus Cattle Society for the best Aberdeen-Angus.

[4] Silver Medal given by the English Aberdeen-Angus Cattle Association for the best animal bred in England or Wales.

1057 III.—EDWARD A. WIGAN, Conholt Park, Andover, for Ita of Conholt 104513, born Jan. 8, 1933; *s.* Bertram of Coull 69412, *d.* Rosebloom of Conholt 80159 *by* Behemah of Bleaton 51799.
1058 IV.—THE MARQUESS OF ZETLAND, G.C.S.I., G.C.I.E., Aske, Richmond, Yorks., for Elanora of Aske 104555, born Jan. 28, 1933; *s.* Gratuitous 64618, *d.* Elanora of Kinermony 93011 *by* Essence of Ballindalloch 56868.
1048 V.—CAPT. A. L. GOODSON, Kilham, Mindrum, for Prunette of Kilham 102654, born Feb. 25, 1933; *s.* Perseus of Whalton 74947, *d* Pride of Kilham 93476 *by* Kythe of Dunira 64963.
1047 R.N.—CAPT. A. L. GOODSON, for Eulima 6th of Kilham.
Cup.[1]—LADY ROBINSON.
R.N. for Cup.[1]—VISCOUNT ALLENDALE.

Belted Galloways.

Class 137.—*Belted Galloway Bulls, born on or before November* 30, 1933.

1059 I. & Champion.[2]—J. J. BELL-IRVING, Makerstoun, Kelso, for Mark Haig 969 B., born July 28, 1927, bred by R. Graham, Auchengassel, Twynholm; *s.* Glenzier Wotan 429 B., *d.* Mark Polly 219 B. *by* Mark Champion 55 B.
1060 II.—GEN. SIR IAN HAMILTON, 1 Hyde Park Gardens, London, W., for Lullenden Concrete 983 B., born Jan. 9, 1930; *s.* Allington Concrete 467 B., *d.* Gartmore Pamela 3rd 1042 B. *by* Mark Hector 56 B.
1061 III.—THE NALC COMPANY, LTD., Gartmore, Stirling, for Gartmore Peter 1033 B., born Jan. 24, 1932, bred by Sir August Cayzer, Bart., Gartmore; *s.* Gartmore Nigel 839 B., *d.* Gartmore Soncie 3rd 1626 B. *by* Mark Hector 56 B.

Class 138.—*Belted Galloway Cows or Heifers, in-milk, born on or before November* 30, 1931.

1069 I.—THE NALC COMPANY, LTD., Gartmore, Stirling, for Gartmore Norah 1st 2066 B., born April 1, 1930, calved March 8, 1934, bred by Sir August Cayzer, Bart., Gartmore; *s.* Glenzier Watermark 725 B., *d.* Gartmore Bella 2nd *by* Mark Hector 56 B.
1067 II.—THE NALC COMPANY, LTD., for Gartmore Doreen 2nd 2056 B., born March 16, 1930, calved June 8, 1934, bred by Sir August Cayzer, Bart., Gartmore; *s.* Glanzier Watermark 725 B., *d* Gartmore Doreen 1st 1812 B *by* Mark Hector 56 B.
1064 III.—GEN. SIR IAN HAMILTON, 1 Hyde Park Gardens, London, W. for Lullenden Estelle 2nd 2118 B., born Jan. 17, 1930, calved Dec. 1, 1933; *s.* Lullenden Falstaff 697 B., *d.* Gartmore Estelle 1st 1030 B. *by* Mark Hector 56 B.
1062 R.N.—J. J. BELL-IRVING, Makerstoun, Kelso, for Makerstoun Ivy.

Class 139.—*Belted Galloway Heifers, born on or between December* 1, 1931, *and November* 30, 1932.

1071 I. & R.N. for Champion.[2]—THE NALC COMPANY, LTD., Gartmore, Stirling, for Gartmore Edith 1st 3058 B., born April 1, 1932, bred by Sir August Cayzer, Bart., Gartmore; *s.* Knockbrex Eagle 685 B., *d.* Gartmore Lucy *by* Tramp of Auchengassel 13488.
1070 II.—THE NALC COMPANY, LTD., for Gartmore Dandy 4th 3054 B., born Dec. 6, 1931, bred by Sir August Cayzer, Bart., Gartmore; *s.* Knockbrex Eagle 685 B., *d.* Gartmore Dandy 1st *by* Mark Hector 56 B.

Class 140.—*Belted Galloway Heifers, born on or between December* 1, 1932, *and November* 30, 1933.[3]

1074 I.—THE NALC COMPANY, LTD., Gartmore, Stirling, for Gartmore Christian 3rd 3220 B., born March 4, 1933; *s.* Knockbrex Eagle 685 B., *d.* Nan of Auchengassel 27570 *by* Tramp of Auchengassel 13488.
1075 II.—THE NALC COMPANY, LTD, for Gartmore Molly 3rd 3240 B., born Dec. 13, 1932, bred by Sir August Cayzer, Bart., Gartmore; *s.* Knockbrex Eagle 685 B., *d.* Gartmore Mollie 2nd 1854 B. *by* Gartmore Admiral 2nd 85 B.
1072 III.—GEN. SIR IAN HAMILTON, 1 Hyde Park Gardens, London. W., for Lullenden Betty 3282 B., born April 2, 1933; *s.* Knockbrex Heron 955 B., *d.* Gartmore Grace 3rd 1032 B. *by* Mark Hector 56 B.
1073 R.N.—GEN. SIR IAN HAMILTON, for Lullenden Heather.

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[1] The "Mungoswalls" Silver Challenge Cup given through the English Aberdeen-Angus Cattle Association for the most points awarded in a combination of entries.
[2] The "Knockbrex" Perpetual Silver Challenge Cup given through the Dun and Belted Galloway Cattle Breeders' Association for the best Belted Galloway.
[3] Prizes given by the Dun and Belted Galloway Cattle Breeders' Association.

Dairy Shorthorns.

Class 145.—*Dairy Shorthorn Bulls, born in or before* 1931.

1078 I. & Champion.[1]—SIR MARK COLLET, Bart., St. Clere, Kemsing, Sevenoaks, for Greattew Waterloo 223446, dark roan, born Dec. 15, 1927, bred by Ralph Tustian, The Leys, Great Tew, Oxfordshire; *s.* Sorbrook Clarence 194218, *d.* 72709 Borohill Waterloo Rosebud 2nd *by* Borohill Pantry Boy 187553.

1087 II.—ROBERT N TORY, Anderson, Blandford, for Anderson Imperial Minstrel 2nd 234697, white, born May 2, 1929, bred by Debenham & Tory, Anderson, Blandford; *s.* Anderson Bates 15th 220511, *d.* 25049 Fulmer Melody *by* Leam Commissioner 149958.

1083 III.—HERBERT H. OWTRAM, Newland Hall, Lancaster, for Embleton Duke of Oxford 250607, roan, born Sept. 6, 1931, bred by W. Browell, Wadd Crag, Embleton, Cumberland; *s.* Orma Rosette Prince 3rd 225338, *d.* 83086 Lady Oxford *by* Bolton's Dairy King 187528.

1077 IV.—CHIVERS & SONS, LTD., Histon, Cambridge for Royal Foggathorpe Prince 253513, roan, born Nov. 4, 1931; *s.* Royal Oak 211121, *d.* 93551 Orma Foggathorpe *by* Wild Eyes Prince 212551.

1079 R.N.—MAJOR R. F. FULLER, Great Chalfield, Melksham, Wilts., for Anderson Imperial Minstrel 4th.
H.C.—1081. C.—1090.

Class 146.—*Dairy Shorthorn Bulls, born in* 1932.

1097 I. & R.N. for Champion.[1]—HOBBS & DAVIS, Kelmscott, Lechlade, Glos., for Kelmscott Premier 40th 258167, roan, born April 1; *s.* Sorbrook Foggathorpe Premier 3rd 219269, *d.* 87830 Kelmscott Primula 183rd *by* Kelmscott Imperialist 36th 164408.

1092 II.—T. R. C. BLOFELD, Hoveton Home Farm, Wroxham, Norfolk, for Streetly Lord York 4th 260462, light roan, born Aug. 11, bred by S. Owen Webb, Streetly Hall, West Wickham; *s.* Barleywood White Duke 228097, *d.* 92479 Streetly Lady York *by* Grand Champion 190168.

1105 III.—WALTER H. VIGUS, Revels Croft, Bengeo, Hertford, for Chalfield Lord Darlington 11th 256066, roan, born Dec. 12, bred by Major R. F. Fuller, Great Chalfield, Melksham; *s.* Primrose Gift's Heir 2nd 210474, *d.* 36528 Chalfield Lady Darlington *by* Wild Gift 146378.

1096 IV.—F. S. FRANCIS, Wilkinthroop Farm, Templecombe, for Otus 259121, white, born Jan. 10; *s.* Seaplane 233426, *d.* 34598 Thurnham Telluria 2nd *by* Loobagh Duke 3rd 157324.

1094 V.—J. ONSLOW FANE, Steventon Manor, Hants., for Steventon Fire Drake 260358, white, born Jan. 12; *s.* Revels Count 225956, *d.* 112807 Playford Countess *by* Don Marigold 162813.

1109 R.N.—G. H. WILLIS, Birdlip, Glos., for Rosette Beau.
H.C.—1093, 1106.

1097, 1199, 1228 R.N. for Cup.[2]—HOBBS & DAVIS, for Kelmscott Premier 40th, Kelmscott Melody 84th and Kelmscott Birthright 9th.

Class 147.—*Dairy Shorthorn Bulls, born on or between January* 1 *and March* 31, 1933.

1118 I.—MAJOR G. MILLER MUNDY, Red Rice, Andover, for Clanville Wild Bates, red, born Jan. 6, bred by Capt. A. R. Heath, Clanville Lodge, Andover; *s.* Anderson Wild Bates 9th 241508, *d* 112950 Longhills Crimson Bates *by* Histon Wild Prince 156497.

1113 II.—SIR MARK COLLET, Bart., St. Clere, Kemsing, Sevenoaks, for St. Clere Masterman, dark roan, born Feb. 12; *s.* Harehill St. Bardolph 2nd 230740, *d.* 72048 St. Clere Catherine 2nd *by* Haddon Nonsuch 2nd 172198.

1129 III.—SIMPSON WILLIAMSON, Green House, Alveley, Bridgnorth, for Pilling Reality, roan, born Feb. 12, bred by Wm. Pearson, Pilling, Garstang; *s.* Wreay Pilate 287517, *d* 119670 Loughead Roan Rosette *by* Dupplin Silver Coin 206980.

1116 IV.—LORD LOCH, Stoke College, Stoke-by-Clare, Suffolk, for Stokecollege Lord Leicester, roan, born Feb. 28; *s.* Stokecollege Secundus 253949, *d.* 131757 Leek Wild Duchess *by* Lord Leicester 83rd 231718.

1125 V.—S. A. N. WATNEY, Catthorpe, Leicestershire, for Foxhill Solid Silver, white, born March 1, bred by Capt. the Rt. Hon. E. A. FitzRoy. M.P., Foxhill, West Haddon, Rugby; *s.* Aldenham Lord Kirklevington 212843, *d.* 73527 Foxhill Wild Maid 2nd *by* Foxhill Royal Charles 189835.

1112 R.N.—JOHN BARNES, Aikbank, Wigton, for Parton Rubicon.
H.C.—1115, 1128 C.—1127.

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[1] Champion Prize of £10 given by the Dairy Shorthorn Association and Shorthorn Society Joint Prize Fund for the best Bull.

[2] The "Grendon" Silver Challenge Cup given through the Dairy Shorthorn Association for the best groups of one Bull and two Cows or Heifers. Two at least of the animals must have been bred by the Exhibitor.

Class 148.—*Dairy Shorthorn Bulls, born on or between April* 1 *and June* 30, 1933.[1]

1137 I.—Capt the Rt. Hon. E. A. Fitz Roy, M.P., Foxhill, West Haddon, Rugby, for **Foxhill Sunbeam**, roan, born May 1; *s.* Foxhill Sunlight 244088, *d.* 107532 Foxhill Wild Eyes 8th *by* Wild Eyes Dairyman 186265.

1136 II.—J. Onslow Fane, Steventon Manor, Hants., for **Steventon Forester**, dark roan, born June 3; *s.* Dolphinlee Waterloo King 256938, *d.* 117952 Steventon Marigold *by* Revels Count 225956.

1152 III.—Joshua A. Williams, Castle Hill, Pannal Ash, Harrogate, for **Moorpark Winsome King**, roan, born April 26; *s.* Underley Rex 254287, *d.* 124695 Winsome Marchioness *by* Telluria Marquis 211926.

1134 IV.—Chivers & Sons, Ltd., Histon, Cambridge, for **Histon Geneva Duke**, roan, born June 23; *s.* Histon Foggathorpe Dairyman 216355, *d.* 116688 Wild Duchess of Geneva 233rd *by* Tockenham Keystone 10th 152613.

1139 V.—Sir William Hicking, Bart., Brackenhurst Hall, Southwell, for **Brackenhurst Royal Leader**, red and little white, born June 10; *s.* Brackenhurst Red Prince 228455, *d.* 90360 Debden Rose *by* Rushcourt Bandit 2nd 202534.

1146 R.N.—T. A. Rose, Churchill Heath, Kingham, Oxford, for **Churchill Marksman.**

H.C.—1135, 1147. C.—1144.

1139, 1185, 1239 Cup.[1]—Sir William Hicking, Bart., for **Brackenhurst Royal Leader, Debden Cherry Bandeau and Brackenhurst Bonnie Jean.**

Class 149.—*Dairy Shorthorn Bulls, born on or between July* 1 *and December* 31, 1933.

1175 I.—The Duke of Westminster, G.C.V.O., D.S.O., Eaton Home Farm, Aldford, Chester, for **Penwortham Diadem**, roan, born Sept. 28, bred by A. R. Fish, Holm Mead, Preston; *s.* Penwortham Pal 252883, *d.* 98553 Orma Telluria *by* Wild Eyes Prince 212551.

1161 II.—J. Onslow Fane, Steventon Manor, Hants., for **Steventon Yeoman**, roan, born Oct. 9; *s.* Dolphinlee Waterloo King 256938, *d.* 128128 Steventon Yucca *by* Revels Count 225956.

1156 III.—John Barnes, Aikbank, Wigton, for **King of Diamonds**, roan, born July 2; *s.* Whitecroft Snowball 234345, *d.* 80693 Campsfield Johnby Rose 2nd *by* Campsfield Squire 188171.

1155 IV.—C. R. W. Adeane, C.B., Babraham Hall, Cambridge, for **Babraham Lucullus 3rd**, red roan, born Aug. 6; *s.* Greattew Ruben 251114, *d.* 57552 Babraham Lucina 5th *by* Kingsthorpe Forester 143344.

1167 V.—E. Macintosh, Boxhill Farm, Dorking, for **Foxbury Barrington Duke 4th**, dark roan, born July 10; *s.* Sorbrook Dalesman 226584, *d.* 78008 Woolpit Barrington Cran *by* Proud Barrington 184086.

1164 R.N.—Hobbs & Davis, Kelmscott, Lechlade, Glos., for **Kelmscott Statesman 6th.**

H.C.—1163. C.—1162, 1172.

Class 150.—*Dairy Shorthorn Cows, in-milk, born on or before March* 31, 1928, *having yielded a minimum of* 8,000 *lb. of milk during a lactation period of* 315 *days.*[2]

1185 I. & Champion.[3]—Sir William Hicking, Bart., Brackenhurst Hall, Southwell, for **101342 Debden Cherry Bandeau**, roan, born July 17, 1927, calved June 12, 1934, bred by Major W. P. Robertson, Debden, Saffron Walden; *s.* Rushcourt Bandit 2nd 202534, *d.* 30856 Cherry Lass 3rd *by* Knowsley Beau Brocade 137424.

1182 II.—J. Onslow Fane, Steventon Manor, Hants., for **103084 Revels Baroness 2nd**, red and little white, born Oct. 29, 1926, calved April 26, 1934, bred by W. H. Vigus, Revels Croft, Bengeo, Hertford; *s.* Brickendon Crispin 14th 187679 *d.* 103081 Molly *by* Woolmers Crispin 3rd 160519.

1181 III.—John Crowe, Ashe Manor, Overton, Hants., for **95613 Duchess 175th**, white, born May 24, 1927, calved May 27, 1934; *s.* Longhills White Eagle 173075, *d.* 10656 Duchess 3rd *by* Loobagh Beau 3rd 143635.

1180 IV.—John Crowe, for **94554 Cheston Rosette**, roan, born Sept. 20, 1927, calved April 4, 1934, bred by W. Brown, Chesterton Priory, Peterborough; *s.* Longhills White Eagle 173575, *d.* 12827 Plaspower Oxford 2nd *by* Puddington Red Rudolph 182916.

1189 V.—Major G. Miller Mundy, Red Rice, Andover, for **50946 Lady Jean 2nd**, roan, born March 24, 1923, calved June 7, 1934, bred by J. S. & G. Johnston, Belmont, Southwaite, Carlisle; *s.* Goldsmith 163679, *d.* 4598 Jean *by* Waterman 146284.

1194 R.N.—The Duke of Westminster, G.C.V.O., D.S.O., Eaton Home Farm, Aldford, Chester, for **Lawnhead Moss Rose 24th.**

H.C.—1183, 1192.

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[1] The "Grendon" Silver Challenge Cup given through the Dairy Shorthorn Association for the best group of one Bull and two Cows or Heifers. Two at least of the animals must have been bred by the Exhibitor.

[2] Prizes, except Fourth and Fifth, given by the Dairy Shorthorn Association and Shorthorn Society Joint Prize Fund.

[3] Champion Prize of £10, given by the Dairy Shorthorn Association and the Shorthorn Society Joint Prize Fund for the best Cow or Heifer.

Class 151.—*Dairy Shorthorn Cows, in-milk, born on or between April* 1, 1928, *and March* 31, 1929, *having yielded a minimum of* 8,000 *lb. of milk during a lactation period of* 315 *days.*

1197 I. & R.N. for Champion.[1]—FREDERICK CHAPMAN, Chevet Grange, Wakefield, for 105950 Flower 3rd, roan, born Oct. 20, 1928, calved June 18, 1934; *s* Aikton Plantagenet 195519, *d.* 83633 Flower 2nd *by* Queen's Duke 193125.
1203 II.—J. TIMBERLAKE, Hastoe Farm, Tring, for 123874 Hastoe Barrington 17th, red, born Jan. 8, 1929, calved April 7, 1934; *s.* Double Imperial 206832, *d.* Hastoe Barrington 2nd *by* Duke of Acomb 119958.
1205 III.—J. TIMBERLAKE, for 123876 Hastoe Bective 4th, red, born March 11, 1929, calved May 21, 1934; *s.* Double Imperial 206832, *d.* 91901 Hastoe Bective 2nd *by* Broadfields Fearless 196741.
1200 R.N.—A. THOMAS LOYD, Lockinge House, Wantage, for Lockinge Dulce 2nd.
H.C.—1199. C.—1201.
1203, 1205, 1217 Cup & £40.[2]—J. TIMBERLAKE, for Hastoe Barrington 17th, Hastoe Bective 4th and Hastoe Millicent 2nd.
1199, 1210, 1244 R.N. for Cup & £10.[2]—HOBBS & DAVIS, for Kelmscott Melody 84th, Kelmscott Hawthorn 32nd and Kelmscott Primula 207th.

Class 152.—*Dairy Shorthorn Cows, in-milk, born on or between April* 1, 1929, *and March* 31, 1930, *having yielded a minimum of* 6,500 *lb. of milk during a lactation period of* 315 *days.*

1211 I.—SIR EDWARD MANN, Bart., Thelveton Hall, Diss, for 116010 Duchess of Barrington 2nd, dark roan, born Dec. 22, 1929, calved Feb. 23, 1934, bred by J. Britten, Clifton Reynes, Olney, Bucks.; *s.* Throop Drusus 219693, *d.* 107609 Cranwold Barrington 16th *by* False Start 171536.
1217 II.—J. TIMBERLAKE, Hastoe Farm, Tring, for 134012 Hastoe Millicent 2nd, red and little white, born March 20, 1930, calved May 26, 1934; *s.* Double Imperial 206832, *d.* Millicent *by* Yeldersley Prince George 118741.
1220 III.—G. H. WILLIS, Birdlip, Glos., for 118074 Knells Golden Duchess 2nd, dark roan, born May 23, 1929, calved June 17, 1934, bred by Charles Fisher, Knells Farm, Carlisle; *s.* Favourite Blend 180751, *d.* 73403 Knells Golden Duchess *by* Walby Dairy King 194903.
1209 R.N.—F. S. FRANCIS, Wilkinthroop Farm, Templecombe, for Cheston Wild Queen 3rd.

Class 153.—*Dairy Shorthorn Cows or Heifers, in-milk, born on or after April* 1, 1930.

1223 I.—F. S. FRANCIS, Wilkinthroop Farm, Templecombe, for 138506 Throop Barrington Duchess, red, born Jan. 16, 1931, calved Oct. 13, 1933; *s.* Seaplane 233426, *d.* Throop Barrington 5th *by* Thurnham Lord Cran 202436.
1228 II.—HOBBS & DAVIS, Kelmscott, Lechlade, Glos., for 139489 Kelmscott Birthright 9th, dark roan, born Feb. 13, 1931, calved May 25, 1934; *s.* Kelmscott Imperialist 104th 199917, *d.* 124811 Kelmscott Birthright 5th *by* Whitley Beatus 2nd 203996.
1227 III.—HOBBS & DAVIS, for 139488 Kelmscott Betty 35th, red, born Feb. 28, 1931, calved May 8, 1934; *s.* Kelmscott Imperialist 104th 199917, *d.* 74908 Kelmscott Betty 31st *by* Kelmscott Rover 7th 182020.
1233 R.N.—J. TIMBERLAKE, Hastoe Farm, Tring, for Hastoe Lady Hermione 4th.
H.C.—1229.

Class 154.—*Dairy Shorthorn Heifers, in-milk to first calving, born on or after April* 1, 1931.[3]

1239 I.—SIR WILLIAM HICKING, Bart., Brackenhurst Hall, Southwell, for 139333 Brackenhurst Bonnie Jean, roan, born May 4, 1931, calved June 10, 1934; *s.* Brackehurst Red Prince 228455, *d.* 49994 Brackenhurst Jean *by* Royal Ringleader 166746.
1248 II.—LAWRENCE HIGNETT, Hook End Farm, Hook End, Checkendon, Reading, for 139351 Checkendon Acomb, red and little white, born June 26, 1931, calved May 9, 1934; *s.* Thornby Lord Foggathorpe 16th 240714, *d.* 107457 Pinkneys Acomb 2nd *by* Checkendon Bandmaster 188353.

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[1] Champion Prize of £10 given by the Dairy Shorthorn Association and the Shorthorn Society Joint Prize Fund for the best Cow or Heifer.

[2] Perpetual Silver Challenge Cup and a cash prize of £40, given through the Dairy Shorthorn Association, for the best group of three Cows or Heifers by the same sire. The sire must be living in the British Isles, and have produced living progeny in 1934. A cash prize of £10 was awarded in respect of the Reserve Group and a small replica of the Cup was given, through the Dairy Shorthorn Association, to the owner of the sire winning the Cup.

[3] Prizes except Fourth and Fifth, given by the Dairy Shorthorn Association and Shorthorn Society Joint Prize Fund.

1249 III.—A. THOMAS LOYD, Lockinge House, Wantage, for **140542 Lockinge Cowslip 6th**, white, born Oct. 13, 1931, calved April 24, 1934; *s.* Lord Winsome 231740, *d.* 76265 Lockinge Cowslip 3rd *by* Preshute Bandit 151128.

1261 IV.—THE DUKE OF WESTMINSTER, G.C.V.O., D.S.O., Eaton Home Farm, Aldford, Chester, for **144487 Eaton Belle 14th**, dark roan, born July 24, 1931, calved June 14, 1934; *s.* Eaton Ruby Prince 198323, *d* 92552 Eaton Belle 7th *by* Meadow King 174015.

1248 V.—W. E. LONG, Hurts Hall, Saxmundham, for **Hurts Monocle 140448**, red and little white, born April 24, 1931, calved April 17, 1934; *s.* Ockley Chancellor 3rd 201362, *d.* 100732 Hadnock Musical 26th *by* Hadnock Charming 22nd 207931.

1244 R.N.—HOBBS & DAVIS, Kelmscott, Lechlade, Glos., for **Kelmscott Primula 207th.**
H.C.—1246, 1251, 1264.

Lincolnshire Red Shorthorns.

Class 156.—*Lincolnshire Red Shorthorn Bulls, born in or before* 1932.

1273 **I. & Champion.**[1]—E. S. TANSLEY, Bramcotte Hills, Nottingham, for **Seaholm Bob 6th** 26724, born May 28, 1932; *s.* Anderby Bob 24281, *d.* Cockerington No. 137 *by* Petwood Normanby 19700.

1271 **II. & R.N. for Champion.**[1]—CHARLES CHAMBERLAIN, Old Dalby, Melton Mowbray, for **Walcott Conqueror** 26868, born Jan. 15, 1932, bred by John Bembridge, Walcott, Lincoln; *s.* Wolferton Romeo 24236, *d.* Anwick No. 166 *by* Strubby Marshman 25th 22529.

1272 III.—FRANK SAINSBURY, Blunts Hall, Little Wratting, Haverhill, for **Wratting Fascination** 25680, born Aug. 31, 1930; *s.* Scothern Fascination 19776, *d.* Scothern Jessie 6th *by* Wellbourne Surprise 15018.

Class 157.—*Lincolnshire Red Shorthorn Bulls, born in* 1933.

1274 I.—H. GORE BROWNE, Broombriggs, Woodhouse Eaves, Loughborough, for **Broombriggs Alfred**, born March 3; *s.* Saltfleet Waterloo 22442, *d.* Broombriggs Rosalind (Vol. 33, p. 257) *by* Swineshead Bill 20798.

1276 II.—J. G. MCDOUGALL, Chippinghurst Manor, Cuddesdon, Oxon., for **Owmby Bowler 31st**, born May 12, bred by J. T. Greenfield, Owmby, Lincoln; *s.* Anderby Bowler 24290, *d.* Owmby No. 78 (Vol. 35, p. 307) *by* Tathwell Cherryplum 22555.

1277 III.—E. S. TANSLEY, Bramcotte Hills, Nottingham, for **Seaholm Stopper**, born Oct. 20; *s.* Seaholm Rough Coat 26156, *d.* Cockerington No 148 (Vol. 35 p. 346) *by* Petwood Normanby 19700.

Class 158.—*Lincolnshire Red Shorthorn Cows or Heifers, in-milk, born in or before* 1931.[2]

1280 I.—J. A. MARSDEN POPPLE, Daneshill, Stevenage, for **Castlethorpe Ada** (Vol. 38, p. 289), born April 6, 1930, calved May 27, 1934; *s.* Anwick Consul 7th 21876, *d.* Utterby No. 79 *by* Anderby Tishy 17238.

1278 II.—S. CECIL ARMITAGE, Lenton Fields, Nottingham, for **Scremby Myrtle** (Vol. 35, p. 351), born March 11, 1928, calved March 17, 1934, bred by Major E. D. Newman, Scremby Manor, Spilsby; *s.* Scothern Hero 22469, *d.* Scremby Polly *by* Welney Victorious 4th 19946.

1279 III.—J. G. MCDOUGALL, Chippinghurst Manor, Cuddesdon, Oxon., for **Broombriggs Virtue** (Vol. 38, p. 201), born May 11, 1931 calved Oct. 3 1933, bred by H. Gore Browne, Woodhouse Eaves, Loughborough; *s.* Saltfleet Waterloo 22442, *d.* Broombriggs Rosamund *by* Swineshead Bill 20798.

Class 159.—*Lincolnshire Red Shorthorn Cows, in-milk, born in or before* 1929, *showing the best milking properties.*

1285 I.—JOHN EVENS & SON, Burton, Lincoln, for **Burton Priory Lady 7th** (Vol. 35, p. 293), born June 16, 1927, calved June 28, 1934; *s.* Whetstone Bendish 3rd 21791, *d.* Burton Priory Lady 6th *by* Burton Royal Son 17382.

1290 II.—RUSSELL WOOD, Bendish House, Hitchin, for **Bendish Nancy 18th** (Vol. 36 p. 363), born Nov. 12, 1929, calved June 16, 1934; *s.* Ketteringham Milkman 19549, *d.* Bendish Nancy 5th *by* Burton Ruby King 2nd 14314.

1286 III.—JOHN EVENS & SON, for **Burton Young Cherry 20th** (Vol. 35, p. 294), born Sept. 19, 1927, calved Feb. 20, 1934; *s.* Burton Tingle 18th 22011, *d.* Burton Young Cherry 13th *by* Burton Conqueror 2nd 17360.

1291 R.N.—RUSSELL WOOD, for **Bendish Pansy 19th.**
H.C.—1289 **C.**—1287.

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[1]Champion Silver Challenge Cup given through the Lincolnshire Red Shorthorn Association for the best Bull.
[2]Prizes given by the Lincolnshire Red Shorthorn Association.

Class 160.—*Lincolnshire Red Shorthorn Cows or Heifers, in-milk, born in or after* 1930, *showing the best milking properties.*[1]

1292 I. & Champion.[2]—CHIVERS & SONS, LTD., Histon, Cambridge, for **Histon Acacia 5th** (Vol. 37, p. 226), born Oct. 20, 1930, calved May 7, 1934 ; *s.* Bendish Dairy King 23463, *d.* Histon Acacia 4th *by* Histon Dairyman 4th 18590.
1294 II.—JOHN EVENS & SON, Burton, Lincoln, for **Burton Recorder** (Vol. 37, p. 244), born April 6, 1930, calved June 5, 1934 ; *s.* Burton Diligence 3rd 22802, *d.* Broxholme Recorder *by* Burton Tingle 14318.
1296 III.—FRANK SAINSBURY, Blunts Hall, Little Wratting, Haverhill, for **Wratting Cherry** (Vol. 37, p. 312), born March 17, 1930, calved April 23, 1934 ; *s.* Ketteringham Milkman 19549, *d.* Bendish Cherry 14th *by* Burton Ruby King 2nd 14314.
1298 R.N.—JOHN EVENS & SON, for **Burton Nancy 25th.**
H.C.—1297. C.—1295.

Class 161.—*Lincolnshire Red Shorthorn Heifers, born in* 1932.

1304 I.—J. A. MARSDEN POPPLE, Daneshill, Stevenage, for **Castlethorpe Dewdrop**, born Jan. 12 ; *s.* Saltfleet Jumbo 23993, *d.* Saltfleet Dewdrop 6th (Vol. 33, p. 312) *by* Scampton Quality 11912.
1303 II.—J. A. MARSDEN POPPLE, for **Castlethorpe Bertha**, born Dec. 22 ; *s.* Castlethorpe Ajax 25797, *d.* Castlethorpe Alice (Vol. 38, p. 289) *by* Anwick Consul 7th 21876.
1300 III.—H. GORE BROWNE, Broombriggs, Woodhouse Eaves, Loughborough, for **Broombriggs Wistful** (Vol. 39, p. 187), born Feb. 9 ; *s.* Saltfleet Waterloo 22442, *d.* Broombriggs Rosalind *by* Swineshead Bill 20798.
C.—1301.

Class 162.—*Lincolnshire Red Shorthorn Heifers, born in* 1933.

1310 I. & R.N. for Champion.[2]—J. G. MCDOUGALL, Chippinghurst Manor, Cuddesdon, Oxon., for **Chippinghurst Ann**, born May 6 ; *s.* Anderby Dipper 25701, *d.* Melton Spec 5th (Vol. 35, p. 368) *by* Anderby Red Pole 15112.
1309 II.—W. DENNIS & SONS, LTD., Kirton, Boston, for **Kirton Dossie**, born July 15 ; *s.* Broombriggs Victor 25775, *d.* Anwick No. 149 (Vol. 38, p. 225) *by* Strubby Marshman 25th 22529.
1313 III.—E. S. TANSLEY, Bramcotte Hills, Nottingham, for **Seaholm Dolly**, born May 8 ; *s.* Broombriggs Vulcan 25777, *d.* Tathwell Dolly (Vol. 31, p. 281) *by* Anderby Tempter 17226.
1306 R.N.—S. CECIL ARMITAGE, Lenton Fields, Nottingham, for **Lenton Bluebell 3rd.**
H.C.—1312.

South Devons.

Class 163.—*South Devon Bulls, born in or before* 1932.

1314 I.—W. LOUCH, Lanlawren, Polperro, Cornwall, for **Pamflete New Fashion 12901**, born April 4, 1930, bred by F. J. Harvey, Pamflete, Holbeton ; *s.* Englebourne No. 15 12026, *d.* Acorns 9th 32409 *by* Hollowcombe Pamflete Nip 11131.
1315 II.—JOHN ROSSITER, Cholwells, Kingsbridge, Devon, for **Harestone Gladiator 12819**, born April 16, 1930, bred by Henry Chaffe, Harestone, Brixton, Devon ; *s.* Merryman 11181, *d.* Harestone Gladys 18th 32140 *by* Keaton Prince 3rd 9854.

Class 164.—*South Devon Bulls, born in* 1933.

1318 I.—JOHN T. DENNIS, Winsor, Yealmpton, Devon, for **Lawhyre Masher 5th**, born Feb. 5, bred by Sir Charles E. B. Hanson, Bart., Fowey Hall, Cornwall ; *s.* Lawhyre Masher 1st 12528, *d.* Lawhyre Beauty 8th 32369 *by* Flete Prince 10235.
1319 II.—MISS JERVOISE SMITH, Sandwell, Harberton, Totnes, for **Sandwell Premier**, born Sept. 1 ; *s.* Harestone Premier 12822, *d.* Sandwell Sundew 32784 *by* Pamflete Smashaway 10400.
1317 III.—R. W. CHAFFE, Worswell Barton, Revelstoke, Newton Ferrers, for **Worswell Captain 5th**, born Sept. 11 ; *s.* XL Captain 13184, *d.* Worswell Phyllis 2nd 33076 *by* Henry 11126.
1320 R.N.—GEORGE WILLS, Rydon, Newton Abbot, for **Rydon Forester 11th.**

Class 165.—*South Devon Cows or Heifers, in-milk, born in or before* 1931.

1321 I.—R. W. CHAFFE, Worswell Barton, Revelstoke, Newton Ferrers, for **Worswell Patience 3rd 33793**, born Oct. 13, 1928, calved Sept. 4, 1933 ; *s.* Worswell Drummer 11952, *d.* Worswell Gladys 13th 24591 *by* Worswell Paymaster 8926.
1325 II.—JOHN T. DENNIS, Winsor, Yealmpton, Devon for **Flete Edna 35663**, born April 10, 1930, calved Oct. 1, 1933, bred by Lord Mildmay of Flete, Flete, Ermington ; *s.* Englebourne No. 20 12225, *d* Flete Sylvia 33454 *by* Widland No 1 10077.
1327 III.—MISS JERVOISE SMITH, Sandwell, Harberton, Totnes, for **Crocus 34960**, born April 6, 1929, calved Sept. 1, 1933, bred by J. Rossiter, Cholwells, Kingsbridge ; *s.* Harestone Pilot 10266, *d.* Cherry 29117 *by* Pansy's Napoleon 9362.
1324 R.N.—DARTINGTON HALL, LTD., Old Parsonage Farm, Totnes, for **Pat.**

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[1] Prizes given by the Lincolnshire Red Shorthorn Association.
[2] Champion Silver Challenge Cup given through the Lincolnshire Red Shorthorn Association for the best Cow or Heifer.

Class 166.—*South Devon Heifers, born in* 1932 *or* 1933.[1]

1333 I.—George Wills, Rydon, Newton Abbot, for **Primula 9th 37383**, born Jan. 7, 1932; *s.* Charleton No. 55 12416, *d.* Primula 6th 34375 *by* Dairy King 11407.
1332 II.—John Rossiter, Cholwells, Kingsbridge, for **Cholwells Gipsy**, born Feb. 25, 1933; *s.* Harestone Gladiator 12819, *d.* Gipsy 32747 *by* Harestone Pilot 10266.
1330 III.—R. W. Chaffe, Worswell Barton, Revelstoke, Newton Ferrers, for **Worswell Gladys 24th**, born July 12, 1933; *s* XL Captain 13184, *d.* Worswell Gladys 22nd 35240 *by* Flete Prince 10235.
1331 R.N.—John T. Dennis, Winsor Yealmpton, Devon, for **Coleridge Flirt.**

Red Polls.

Class 167.—*Red Poll Bulls, born in or before* 1931.

1341 I. & Champion.[2]—J. G. Gray, Coombe Abbey, Coventry, for **Abbeycombe Fabian 15561**, born Oct. 19, 1930; *s.* Abbeycombe Drake 14747, *d.* 30379 Seven Springs Lucy *by* Harefield Clinker 11000.
1336 II.—C. H. Cearn, Gatwick Farm, Upper Gatton, Reigate for **Abbeycombe Fencer 15563**, born Nov. 3, 1930, bred by J. G Gray, Coombe Abbey, Coventry; *s* Abbeycombe Drake 14747, *d.* 38725 Abbeycombe Catkin *by* Wisset Dad 13265.
1343 III.—Stuart Paul, Kirton Lodge, Ipswich, for **Gresham Magnet 14904**, born April 5, 1928, bred by Lt.-Col. R. C. Batt Gresham Hall Norwich; *s.* Bredfield Dairius 2nd 12942, *d.* 34018 Gresham Mayfly *by* Basildon Royal 11882.
1340 IV.—Raymond J. S. Crisp, Kirby Cane Hall, Bungay, for **Battlies Lad 15592**, born April 1, 1930, bred by Major J. S. Agnew, The Battlies, Rougham, Bury St. Edmunds; *s.* Gresham Lad 14903, *d.* 29588 Battlies Lady Kate *by* Helmingham Kerry 11994.
1342 R.N.—J. N. Kendall, Brimpsfield Park, Glos., for **Brimpsfield Bonaparte.**
H.C.—1344. C.—1334.

Class 168.—*Red Poll Bulls, born on or between January* 1 *and May* 31, 1932.

1350 I. & R.N. for Champion.[2]—Sir Guy Hambling, Bart., Rookery Park, Yoxford, Suffolk, for **Yoxford Royal 2nd 16607**, born March 2; *s.* Abbeycombe Drake 14747, *d.* 44509 Yoxford Mavis 2nd *by* Yoxford Challenger 14389.
1355 II.—Stuart Paul, Kirton Lodge, Ipswich, for **Kirton Moses 16459**, born Jan. 2; *s.* Wissett Clinker 4th 15545, *d.* 27041 Kirton Moss 1st *by* Shotford 11200.
1354 III.—Lady Loder, Leonardslee, Horsham, for **Leonardslee Eastern Lord 16475**, born Feb. 14; *s.* Sporle Eastward Ho ! 15132, *d.* 36077 Lichfield Lucy 8th *by* Gaddesby Gauntlett 12620.
1352 IV.—Lt.-Col. C Heyworth-Savage, Bradwell Grove, Burford, Oxford, for **Abbeycombe Heystar 16314**, born March 29, bred by J. G. Gray, Coombe Abbey, Coventry; *s.* Marsden Morning Star 15413, *d.* 30379 Seven Springs Lucy *by* Harefield Clinker 11000.
1349 V.—J. G. Gray, Coombe Abbey, Coventry, for **Abbeycombe Royal Roseman 16315**, born May 11; *s.* Marsden Mars 13501, *d.* 36999 Basildon Royal Rosie 5th *by* Basildon Clansman 12919.
1346 R.N.—Lt.-Col. R. C. Batt, C.B.E., M.V.O., Gresham Hall, Norwich, for **Bradwell Pollux.**
H.C.—1347, 1356. C.—1359.

Class 169.—*Red Poll Bulls, born on or between June* 1 *and December* 31, 1932.

1366 I.—Stuart Paul, Kirton Lodge, Ipswich, for **Fersfield Red Fox 9th 16406**, born June 15, bred by S. E. Radford, Algar House, Fersfield, Diss; *s.* Mickleover Red Fox 15049, *d.* 38768 Arwarton Mystery 4th *by* Bredfield Monarch 12539.
1364 II.—H. D. Longe, Abbot's Hall, Stowmarket, for **Combs Firebrand 5th**, born Aug. 10; *s.* Heveningham Rajah 15338, *d.* 27153 Miss Rosamond 6th *by* Combs Cordite 4th 10966.
1360 III.—His Majesty The King, Sandringham, Norfolk, for **Royal Pilot 16546**, born Oct. 24; *s.* Westacre Dreadnought 15933, *d.* 46033 Royal Artifice *by* Hatton Faber 14151.
1365 IV.—Capt. F. J. O. Montagu, Shortgrove Hall, Newport, Essex, for **Royal Advocate 16543**, born Dec. 21, bred by His Majesty The King, Sandringham; *s.* Glevering Avocet 15706, *d.* 40240 Royal Violet *by* Royal Crimson 11763.
1373 R.N.—W. Woodgate, Fairfield, Framlingham, Woodbridge, for **Framlingham Whirlwind.**
H.C.—1367. C.—1362, 1368.

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[1] Prizes given by the South Devon Herd Book Society.
[2] Champion Prize of £5 given by the Red Poll Cattle Society for the best Bull.

Class 170.—*Red Poll Bulls, born on or between Jauuary* 1 *and May* 31, 1933.

1378 I.—J. G. Gray, Coombe Abbey, Coventry, for **Abbeycombe Ideal 16608**, born May 7; *s.* Abbeycombe Fabian 15561, *d.* 32071 Benhall Bessy *by* Ickworth Commodore 12017.
1382 II.—Sir Guy Hambling, Bart., Rookery Park, Yoxford, Suffolk, for **Yoxford Royal 3rd 16922**, born Jan. 18; *s.* Abbeycombe Drake 14747, *d.* 30347 Royal Mavis *by* Royal Sunshine 11452.
1386 III.—Harold Lilley, Little Clacton Lodge, Clacton-on-Sea, for **Clacton Duke 16685**, born April 22; *s.* Bromley Eros 15637, *d.* 30859 Clacton Frisky *by* Bromeswell Bean 11579.
1381 IV.—Capt. R. S. Hall, New Hall, Tendring, Clacton-on-Sea, for **Newhall Champagne 5th 16831**, born Jan. 2; *s.* Bromley Champagne 14832, *d.* 36667 Theobalds Sunshine 5th *by* Theobalds Duke 13237.
1379 V.—J. G. Gray, for **Abbeycombe Royal Roseman 2nd 16612**, born Feb. 19; *s.* Marsden Mars 13501, *d.* 40819 Basildon Royal Rosie 8th *by* Basildon Regulator 14026.
1388 R.N.—Stuart Paul, Kirton Lodge, Ipswich, for **Kirton Drake.**
H.C.—1387, 1390. C.—1385, 1392.

Class 171.—*Red Poll Bulls, born on or between June* 1 *and December* 31, 1933.[1]

1402 I.—Lady Loder, Leonardslee, Horsham, for **Leonardslee Bonnie Boy**, born June 7; *s.* Leonardslee Paragon, *d.* 40913 Bradenham Bonnie *by* Sporle Recorder 14321.
1401 II.—Capt. R. S. Hall, New Hall, Tendring, Clacton-on-Sea, for **Fersfield Red Fox 16th 16725**, born July 2, bred by S. E. Radford, Fersfield, Diss; *s.* Mickleover Red Fox 15049, *d.* 34380 Lowther Jerkin *by* Framlingham Chieftain 12290.
1406 III.—Capt. Alan Richardson, Seven Springs Farm, Cheltenham, for **Seven Springs Quarry 16859**, born July 6; *s.* Meddler Full Cry 13138, *d.* 30380 Seven Springs Quest *by* Harefield Clinker 11000.
1404 IV.—G. M. T. Pretyman, Orwell Park, Ipswich, for **Brightwell Bonny Boy 16652**, born June 7; *s.* Basildon Count 15213, *d.* 29639 Brightwell Beauty *by* Aspall Cardinal 11257.
1399 V.—Mrs. C. N. Dyer, Hyders, Crawley, Sussex, for **Hyders Lifeguard**, born Aug. 3; *s.* Ashmoor Alert 13284, *d.* 45630 Lichfield Roseleaf 9th *by* Gaddesby Gauntlet 12620.
1409 R.N.—Wilfrid W. Wright, Gages, Little Maplestead, Halstead, for **Maplestead Mercury.**
H.C.—1397. C.—1394.

Class 172.—*Red Poll Cows, in-milk, born in or before* 1928.

1412 I & Champion.[2]—Lt.-Col. Sir Merrik R. Burrell, Bart., C.B.E., Knepp Castle Estate Office, Horsham, for **39760 Knepp Prudence 8th**, born Aug. 18, 1927, calved June 25, 1934; *s.* Knepp Meadow Marquis 13097, *d.* 27083 Knepp Prudence *by* Sudbourne Crown 10803.
1410 II.—His Majesty The King, Sandringham, Norfolk, for **32960 Necton Daffodil**, born Sept. 18, 1923, calved Feb. 3, 1934, bred by R. Harvey Mason, Necton Hall, Swaffham; *s.* Marham Armistice 11410, *d.* 26401 Necton Dolores *by* Shrewsbury 10489.
1423 III.—Sir Guy Hambling, Bart., Rookery Park, Yoxford, Suffolk, for **40670 Yoxford Maiden**, born Sept. 29, 1927, calved May 15, 1934, bred by the late Sir Herbert Hambling, Bart.; *s.* Knepp Grenadier 13467, *d.* 27968 Knepp Madge *by* Sudbourne Beacon 10919.
1420 IV.—Mrs. M. L. Griffith, Little Hallingbury Park, Bishop's Stortford, for **37525 Grundisburgh Ruby**, born Sept. 30, 1926, calved April 2, 1934, bred by Lord Cranworth, Grundisburgh, Suffolk; *s.* Gresham Mainstay 13030, *d.* 30687 Assington Diamond *by* Melton Prosper 11740.
1414 V.—Lord Cranworth, Grundisburgh, Suffolk, for **37530 Grundisburgh Wanderer**, born July 4, 1926, calved May 14, 1934; *s.* Gresham Mainstay 13030, *d.* 32532 Grundisburgh Tourist *by* Framlingham Fanatic 12612.
1432 R.N.—Walter Scrimgeour, Wissett Hall, Halesworth, Suffolk, for **Wissett Nonsuch.**
H.C.—1424, 1429, 1434. C.—1411, 1427.

Class 173.—*Red Poll Cows or Heifers, in-milk, born in* 1929 *or* 1930.[1]

1440 I.—Lord Cranworth, Grundisburgh, Suffolk, for **43388 Grundisburgh Good Duck**, born July 22, 1929, calved April 7, 1934; *s.* Longford Drake 14229, *d.* 35746 Grundisburgh Good Luck *by* Framlingham Fanatic 12612.
1450 II.—H. D. Longe, Abbot's Hall, Stowmarket, for **43063 Combs Miss Rosamund 6th**, born July 15, 1929, calved Dec. 30, 1933; *s.* Combs Peter 14469, *d.* 27158 Miss Rosamund 6th *by* Combs Cordite 4th 10966.
1441 III.—Lord Cranworth, for **43396 Grundisburgh Wander Duck**, born March 16, 1929, calved May 27, 1934; *s.* Longford Drake 14229, *d.* 37530 Grundisburgh Wanderer *by* Gresham Mainstay 13030.

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[1] **Prizes, except Fourth and Fifth, given by the Red Poll Cattle Society.**
[2] **Champion Prize of £5 given by the Red Poll Cattle Society for the best Cow or Heifer.**

1449 IV.—SIR GUY HAMBLING, Bart., Rookery Park, Yoxford, Suffolk, for 46481 **Yoxford Charlotte 3rd**, born April 2, 1930, calved May 30, 1934, bred by the late Sir Herbert Hambling, Bart.; *s.* Yoxford Challenger 14389, *d.* 34114 Henham Charlotte *by* Saham Shrewd Boy 11455.

1445 V.—A. W. GORDON, Letton Hall Home Farm, Shipdham, Norfolk, for 43785 **Marham Planchet**, born Feb. 1, 1929, calved May 2, 1934, bred by T. Brown & Sons, Marham, Norfolk; *s.* Royal Crimson 11763, *d.* 24577 Handsome Plantain *by* Ashlyns Count 10125.

1453 R.N.—STUART PAUL, Kirton Lodge, Ipswich, for **Meddler Sparkle**.
H.C.—1437, 1438, 1443, 1455. C.—1452.

Class 174.—*Red Poll Heifers, in-milk, born in* 1931, *that have bred one calf.*

1474 I. & Cup.[1]—G. M. T. PRETYMAN, Orwell Park, Ipswich, for 46736 **Brightwell Charter 3rd**, born April 13, calved Oct. 23, 1933; *s.* Basildon Count 15213, *d.* 35346 Brightwell Charter *by* Ferrymoor Dairyman 12287.

1462 II. & R.N. for Cup.[1]—LORD CRANWORTH, Grundisburgh, Suffolk, for 47263 **Grundisburgh Princess Voyager**, born May 28, calved April 23, 1934; *s.* Grundisburgh Prince 14912, *d.* 29560 Assington Voyager *by* Ashmoor Pilot 11527.

1463 III.—MRS. PERCY CROSSMAN, Great Bromley Hall, Colchester, for 47699 **Marlesford Jenny 3rd**, born April 7, calved Dec. 3, 1933, bred by Capt. C. S. Schreiber, Marlesford Hall, Wickham Market; *s.* Bredfield Peer 4th 14822, *d.* 36181 Marlesford Jenny *by* Chequers Falcon 12552.

1466 IV.—MRS. C. N. DYER, Hyders, Crawley, Sussex, for 47486 **Hyders Roseleaf**, born May 23, calved June 16, 1934; *s.* Gaddesby Gauntlet 12620, *d.* 37492 Graunt Courts Blush Rosebud *by* White Hill Mogul 13613.

1468 V.—SIR GUY HAMBLING, Bart., Rookery Park, Yoxford, Suffolk, for 48479 **Yoxford Mavis 3rd**, born Jan. 1, calved April 5, 1934, bred by the late Sir Herbert Hambling, Bart.; *s.* Abbeycombe Drake 14747, *d.* 30347 Royal Mavis *by* Royal Sunshine 11452.

1471 R.N.—HENRY D. LEWIS, Combwell Priory, Flimwell, Hawkhurst, for **Ranksborough Hurry**.
H.C.—1460. C.—1461, 1472.

Class 175.—*Red Poll Heifers, born in* 1932.

1492 I. & R.N. for Champion.[2]—SIR GUY HAMBLING, Bart., Rookery Park, Yoxford, Suffolk, for 50612 **Yoxford Beryl 4th**, born April 30; *s.* Abbeycombe Drake 14747, *d.* 27962 Knepp Beryl *by* Harefield Bestman 10999.

1486 II.—MRS. C. C. COURTAULD, Froyz Hall, Halstead, Essex, for 49275 **Froyz Opal**, born Feb. 1; *s.* Bredfield Domino 3rd 14444, *d.* 41367 Froyz Trinket *by* Helmans Hector 13785.

1476 III.—HIS MAJESTY THE KING, Sandringham, for 50132 **Royal Elf**, born Jan. 22; *s.* Hatton Faber 14151, *d.* 40228 Royal Fairy 2nd *by* Royal Crimson 11763.

1495 IV.—LT.-COL. C. HEYWORTH-SAVAGE, Bradwell Grove, Burford, Oxford, for 48699 **Bradwell Dolly**, born Jan. 17; *s.* Upton Marquis 14708, *d.* 35310 Bradwell Duchess *by* Bredfield Nathan 12945.

1498 V.—STUART PAUL, Kirton Lodge, Ipswich, for 49613 **Kirton Claret**, born Jan. 14; *s.* Wissett Clinker 4th 15545, *d.* 41642 Kirton Clara *by* Bredfield Pedlar 2nd 13318.

1503 R.N.—WALTER SCRIMGEOUR, Wissett Hall, Halesworth, Suffolk, for **Wissett Pansy**.
H.C.—1487, 1493, 1494. C.—1477, 1483, 1505.

Class 176.—*Red Poll Heifers, born in* 1933.

1527 I.—N. A. HEYWOOD, Glevering Park, Wickham Market, Woodbridge, for 51445 **Glevering Petrel**, born Jan. 22; *s.* Bredfield Romulus 5th 14049, *d.* 37614 Henham Perfection *by* Hutton Assessor 13067.

1530 II.—STUART PAUL, Kirton Lodge, Ipswich, for 51381 **Foxearth Morning Star**, born Feb. 28, bred by J. P. Brand, Brook Hall, Foxearth, Long Melford; *s.* Abbey Oaks Florentine 15197, *d.* 37424 Foxearth Star Duchess *by* Neatham Curly 13154.

1528 III.—LT.-COL. C. HEYWORTH-SAVAGE, Bradwell Grove, Burford, Oxford, for 50824 **Bradwell Clarissa**, born Jan. 28; *s.* Upton Marquis 14708, *d.* 40919 Bradwell Countess *by* Red Pepper 14040.

1525 IV.—SIR GUY HAMBLING, Bart., Rookery Park, Yoxford, Suffolk, for 52750 **Yoxford Maiden 4th**, born March 22; *s.* Abbeycombe Drake 14747, *d.* 40670 Yoxford Maiden *by* Knepp Grenadier 13467.

1524 V.—J. G. GRAY, Coombe Abbey, Coventry, for 51228 **Delamere Marque**, born Feb. 18, bred by W. G. Clegg, Abbeywood, Delamere, Northwich; *s.* Seven Springs Quaker 15894, *d.* 45725 Marsden Marza *by* Marsden Mars 13501.

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[1] The "Bawdsey" Silver Challenge Cup given through the Red Poll Cattle Society for the best Heifer in-milk in Class 174.

[2] Champion Prize of £5 given by the Red Poll Cattle Society for the best Cow or Heifer.

1513 R.N.—C. H. CEARN, Gatwick Farm, Upper Gatton, Reigate, for **Chipstead Madeira.**
H.C.—1511, 1512, 1520, 1533, 1536. C.—1516, 1526, 1529, 1537.
1350, 1492, 1525 Cup.[1]—SIR GUY HAMBLING, Bart., for **Yoxford Royal 2nd, Yoxford Beryl 4th and Yoxford Maiden 4th.**
1338, 1486, 1516 R.N. for Cup.[1]—MRS. C. C. COURTAULD, for **Froyz Falstaff, Froyz Opal and Froyz Cello.**

Blue Albions.

Class 177.—*Blue Albion Bulls, born in or before* 1931.

1540 I. & Champion.[2]—T. H. CALDERBANK, The Hall, Stow Maries, Chelmsford, for **Walden Manners**, born Jan. 12, 1931, bred by A. T. Greenslade, Little Walden Park, Saffron Walden; *s.* Chilcote Blue Boy 1505, *d.* Walden Clara 7650.

Class 178.—*Blue Albion Bulls, born in* 1932.[3]

1543 I. & R.N. for Champion.[2]—W. E. GLOVER, The Shrubberies, Snarestone, Burton-on-Trent, for **Snarestone Jude**, born May 11; *s.* Snarestone Jester 1799, *d.* Snarestone Fashion 3rd 12376 *by* Barton Jude 2nd 1183.

Class 179.—*Blue Albion Bulls, born in* 1933.[3]

1544 I.—W. E. GLOVER, The Shrubberies, Snarestone, Burton-on-Trent, for **Snarestone General**, born April 23; *s.* Snarestone Jester 1799, *d.* Snarestone Duchess 9th 12370 *by* Barton Jude 2nd 1183.
1547 II.—C. H. WEBSTER, Ivonbrook Farm, Grange Mill, Wirksworth, Derbyshire, for **Ivonbrook Guardsman**, born Jan. 12; *s.* Winthorpe Major 1979, *d.* Ivonbrook Model 11220.
1545 III.—ARTHUR PETERS, Westwood Farm, Normandy, Guildford, for **Blagdon Prince Regent**, born Aug. 8; *s.* Blagdon Ixion 1833, *d.* Blagdon Princess Royal 2200.
1546 R.N.—ARTHUR PETERS, for **Blagdon Zog.**

Class 180.—*Blue Albion Cows or Heifers, in-milk, born in or before* 1931

1549 I. & Champion.[4]—W. E. GLOVER, The Shrubberies, Snarestone, Burton-on-Trent, for **Mount Crocus 3rd 12782**, born Aug. 11, 1929, calved June 4, 1934, bred by T. H. Swire & Sons, Mount Farm, Norton-in-Hales, Market Drayton; *s.* Mount Fearless 1731, *d.* Mount Crocus 2nd 9598.
1550 II.—C. H. WEBSTER, Ivonbrook Farm, Grange Mill, Wirksworth, Derbyshire, for **Ivonbrook Betty 12714**, born Feb. 21, 1930, calved June 15, 1934; *s.* Ivonbrook Goalkeeper 1703, *d.* Ivonbrook Bella 12040.
1551 III.—C. H. WEBSTER, for **Ivonbrook Tulip 12736**, born Feb. 25, 1930, calved March 1, 1934; *s.* Ivonbrook Goalkeeper 1703, *d.* Ivonbrook Model 11220.

Class 181.—*Blue Albion Heifers, born in* 1932.

1553 I. & R.N. for Champion.[4]—JOHN BASSETT, Hill Top Farm, Ashover, Derbyshire, for **Asher Blue Pansy**, born Jan. 5; *s.* Asher Blue Barton 12584 *by* Barton Alderman 1607.
1552 II.—JOHN BASSETT, for **Asher Blue Daisy**, born Sept. 5; *s.* Asher Blue Clansman 1829, *d.* Pike Trixie 11268 *by* Bradbourne Masterpiece 2nd 457.
1555 III.—C. H. WEBSTER, Ivonbrook Farm, Grange Mill, Wirksworth, Derbyshire, for **Ivonbrook Empress**, born June 21; *s.* Winthorpe Major 1979, *d.* Ivonbrook Pansy 12052.
1554 R.N.—W. E. GLOVER, The Shrubberies, Snarestone, Burton-onTrent, for **Margery of Snarestone.**

Class 182.—*Blue Albion Heifers, born in* 1933.[3]

1556 I.—JOHN BASSETT, Hill Top Farm, Ashover, Derbyshire, for **Asher Blue Margaret**, born June 28: *s.* Asher Blue Clansman 1829, *d.* Mount Margaret 121 *by* Mount Goalkeeper 1049.
1558 II.—JOHN BASSETT, for **Asher Blue Primrose**, born April 10; *s.* Asher Blue Clansman 1829, *d.* Asher Blue Blossom 10026 *by* Nottil John 335.
1560 III.—T. H. CALDERBANK, The Hall, Stow Maries, Chelmsford, for **Stow Gillian**, born June 16; *s.* Walden Manners, *d.* Stow Prudence 11536 *by* Broomhill Threshold 499.
1561 R.N.—W. E. GLOVER, The Shrubberies, Snarestone, Burton-on-Trent, for **Blue Rose 2nd of Snarestone.**
H.C.—1559.

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[1] The "Henham" Silver Challenge Cup given through the Red Poll Cattle Society for the best group of one Bull and two Cows or Heifers, bred by Exhibitor.
[2] Perpetual Silver Challenge Cup given by the Blue Albion Cattle Society for the best Bull.
[3] Prizes given by the Blue Albion Cattle Society.
[4] Perpetual Silver Challenge Cup given by the Blue Albion Cattle Society for the best Cow or Heifer.

British Friesians.

The letters F.R.S. after the number of an animal indicate that such animal is registered in the Friesch Rundvee Stamboek (Friesland Cattle Herd Book) Zwartebonte (Black and White) Section.

The letters P.I. after the name of an animal indicate that such animal is of pure imported. Friesian (Holland) or South African blood.

Unless otherwise stated the number refers to the British Friesian Herd Book.

Class 183.—*British Friesian Bulls, born in or before* 1931.[1]

1569 I., £20, Champion [2], Champion [3] & Champion.[4]—MALCOLM MCILCHERE, Cartside Farm, Thorntonhall, Lanarkshire, for Kintyre Thorn 36047, born Oct. 26, 1929; *s.* Seaton Ronnie 29849, *d.* Bonnington Heather 79112 *by* Loirston Bravo 20777.

1573 II. £15, R.N. for Champion [2], R.N. for Champion [3] & R.N. for Champion.[4]—THE TRUSTEES OF SIR A. W. MACROBERT, Bart., Douneside Home Farm, Tarland, Aberdeenshire, for Douneside Marcellus 2nd 35647, born Nov. 12, 1929; *s.* Douneside Masterpiece 19835, *d.* Douneside Maris 2nd 92536 *by* Hatsumerschaap 13719.

1562 III. £10.—E. G. BARTON, Saundby, Retford, for Herrington Lochinvar 39155, born July 8, 1931, bred by A. Weightman, Middle Herrington, Sunderland; *s.* Herrington Initialad 34407, *d.* Herrington Ynte Dairymaid 72308 *by* Brooklands Ynte 11145.

1563 IV. £4.—E. G. BARTON, for Saundby Crown Prince 34955, born July 27, 1928; *s.* Routh Dutchman 6939 P.I., *d.* Thurston Karel Ecstasy 49384 *by* Kirkhill (imp.) Karel 2nd 4051.

1578 V. £3.—G. B. RADCLIFFE, Pool Bank, Tarvin, Chester, for Tarvin Janke's Mairschaap 33525 P.I., born May 1, 1927; *s.* Dunninald Haeayemairschaap 7699 P.I., *d.* Tarvin (imp. 1922), Beatty's Janke 66574 *by* Nels Rust Beatty 260 F.H.B.

1564 R.N.—CAPT. W. G. CARR, Ditchingham Hall, Bungay, for Beccles Viceroy.

Class 184.—*British Friesian Bulls, born on or between January* 1 *and June* 30, 1932.

1581 I.—R. G. POSNETT, Norley, Warrington, for Tarvin Warrior 41319, born Jan. 17, bred by G. B. Radcliffe, Pool Bank, Tarvin; *s.* Tarvin Janke's Mairschaap 33525 P.I., *d.* Tarvin Sunflower 141874 *by* Tarvin Janke's Mairschaap 33525 P.I.

1580 II.—COMMITTEE OF VISITORS, BRENTWOOD MENTAL HOSPITAL, Brentwood, for Chebbard Series 40187, born Feb. 23, bred by F. N. Terry, Chebbard Farm, Puddletown, Dorchester; *s.* Northdean Sunstar 4th 31643, *d.* Swords Folly 121602 *by* Moordale Series 29379.

Class 185.—*British Friesian Bulls, born on or between July* 1 *and December* 31, 1932.

1582 I.—F. W. GILBERT, The Manor, Chellaston, Derby, for Winnal Duke 41425, born Sept. 12, bred by T. L. Parke, Withnell Fold Farm, Chorley, Lancs.; *s.* Chellaston Rossini 33993, *d.* Winnal Dahlia 111586 *by* Withnell Joy 24611.

1585 II.—MISS SYBIL WHITNALL, Hill Farm, East Hanningfield, Chelmsford, for Hamels Overlord 40611, born July 23, bred by Ethelbert Furness, Hamels Park, Buntingford; *s.* Hamels Lusty Lad 35881, *d.* Hamels Lonely 137398 *by* Glyndebourn Achilles 31043 P.I.

1583 III.—CAPT. F. F. A. HEILGERS, M.P., Wyken Hall, Bardwell, Bury St. Edmunds, for Wyken Black Boy 41457, born Nov. 24; *s.* Wyken (imp. 1922) Trevor 21887, *d.* Hardinghall Dusky 2nd 127642 *by* Northdean Hollander 4th 26675 P.I.

Class 186.—*British Friesian Bulls, born on or between January* 1 *and June* 30, 1933.

1599 I.—J. R. UPSON, Rush Court, Wallingford, for Saracens General 42889 P.I., born Feb. 4; *s.* Saracens Meibloem Don 38073 P.I., *d.* Henbury Pretty Polly 105860 P.I. *by* Wychnor Frits 7215 P.I.

1592 II.—THE TRUSTEES OF SIR A. W. MACROBERT, Bart., Douneside Home Farm, Tarland, Aberdeenshire, for Douneside Marcus 42085, born May 10; *s.* Douneside Benefactor 3rd 38881, *d.* Douneside Marcelle 145910 *by* Douneside Marcellus 34163.

1590 III.—ARTHUR J. HILL, Denton Park, Ben Rhydding, Yorks., for Ahill Barney 2nd 41493, born Jan. 3; *s.* Hache Freebooter 34329 P.I., *d.* Knebworth Ceres Vixen 117952 *by* Knebworth (imp. 1922) Ceres 2nd 20607

1594 IV.—THE TRUSTEES OF SIR A. W. MACROBERT, Bart., for Douneside Peer 42047, born Jan. 2; *s.* Douneside Masterpiece 19835, *d.* Douneside Pamela 115344 *by* Hache Apollo 22925.

1596 R.N.—A. G. MOBBS, Laurel Farm, Oulton, Lowestoft, for Oulton Bill.

H.C.—1587.

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[1] Prizes, except Fourth and Fifth, given by the British Friesian Cattle Society.

[2] Champion Prize of £10 given by the British Friesian Cattle Society for the best Bull.

[3] The "Mayford" Silver Challenge Trophy given through the British Friesian Cattle Society for the best Bull.

[4] The "Douneside" Silver Challenge Cup given through the British Friesian Cattle Society for the best Bull, bred by Exhibitor.

Class 187.—*British Friesian Bulls, born on or between July 1 and December* 31, 1933.

1605 I.—The Trustees of Sir A. W. MacRobert, Bart., Douneside Home Farm, Tarland, Aberdeenshire, for Douneside Laurimar 42027, born Sept. 22; *s.* Lochlands Rijper 29237, *d.* Douneside Lala 126014 *by* Douneside Pel Klaas 30901 P.I.

1607 Mrs. P. Tory, Shapwick, Blandford, for Crawford Bravo Boy 41895, born July 2; *s.* Crawford Bravo 35552, *d.* Crawford Doll 51700 *by* Dell Hollander 7655 P.I.

1609 III.—Albert Weightman, Middle Herrington Farm, Sunderland, for Herrington Hatsumer Neptune 42331 P.I., born Sept. 26; *s.* Saracens Dennis 38055 P.I., *d.* Herrington Hatsumer 117196 P.I. *by* Wychnor Jan. 24645 P.I.

1608 R.N.—J. R. Upson, Rush Court, Wallingford, for Saracens Grenadier.

Class 188—*British Friesian Cows, in-calf.*[1]

1618 I. & Champion.[2]—Albert Weightman, Middle Herrington Farm, Sunderland, for Ardrossan Glossie 112076, born Oct. 8, 1927, bred by David Parker, High Boydston, Ardrossan; *s.* Standalane Warrior's Duke 29899, *d.* Ardrossan Graceful 67874 *by* Porton Zechariah 15143.

1613 II.—A. G. Mobbs, Laurel Farm, Oulton, Lowestoft, for Oulton Pride 119898, born July 15, 1927; *s.* Oulton (imp. 1922) Officer 21127, *d.* Oulton Dinah 74914 *by* Sparrowyoke Premier 12711.

1615 III.—Piddington (Northants) Estates, Ltd., Horton, Northampton, for Holyport Irene 128096 P.I., born Sept. 12, 1926, bred by H. M. Martineau, Holyport, Maidenhead; *s.* Hedges Second Series 6427 P.I., *d.* Mapleton Irene 84798 P.I. *by* Mapleton (imp. 1922) Hilko 20907.

1611 R.N.—F. W. Gilbert, The Manor, Chellaston, Derby, for Sonning Lodi.

H.C.—1616.

Class 189.—*British Friesian Cows, in-milk, born in or before* 1928, *having yielded a minimum of* 8,000 *lb. of milk during a lactation period of* 315 *days.*[1]

1634 I. £20.—Lord Rayleigh, The Bury, Hatfield Peverel, Chelmsford for Terling Dazzle 15th 121798, born Feb. 24, 1927, calved May 12, 1934; *s.* Terling Marcus 27183, *d.* Terling Dazzle 10th 76748 *by* Terling Jeltje's King 18689 P.I.

1624 II. £15.—F. W. Gilbert, The Manor, Chellaston, Derby, for Winterbourne Dotterell 2nd 111610, born Oct. 29, 1926, calved June 8, 1934, bred by T. Mansfield, Winterbourne, Glos.; *s.* Commieston Bromley Ceres 22379 P.I., *d.* Eastern Dotterell 24346 *by* Monkton Answer 1773.

1637 III. £10.—J. R. Upson, Rush Court, Wallingford, for Saracens Desturgy 131358, born May 18, 1928, calved May 12, 1934; *s.* Hache Burinze 25873 P.I., *d.* Macknade Desturgy 47244 *by* Wychnor Douglas 10887.

1627 IV. £4.—W. J. Newman, Hall Farm, Burnham-on-Crouch, for Creeksea Xmas Day 114720, born Dec. 25, 1927, calved June 2, 1934; bred by Capt. H. F. Jackson, Creeksea, Burnham-on-Crouch; *s.* Hedges Boter Roland 25995, *d.* Oulton Victoria 85842 *by* Oulton (imp. 1922) Officer 21127.

1632 V. £3.—Piddington (Northants) Estates, Ltd., Horton, Northampton, for Groundwell Alice 7th 105324, born March 9, 1926, calved June 11, 1934, bred by J. Sayers, Groundwell Manor, Blunsdon, Swindon; *s.* Groundwell Jewel 25835 P.I., *d.* Groundwell Alice 3rd 53088 *by* Hedges (imp.) Fokke 2nd 8998.

1635 R.N.—Lord Rayleigh, for Terling Floss Hall 16th.

H.C.—1620.

Class 190.—*British Friesian Cows, in-milk, born in* 1929 *or* 1930, *having yielded a minimum of* 6,500 *lb. of milk during a lactation period of* 315 *days.*[1]

1640 I. £20.—Capt. John Christie, M.C., Goat Farm, Ringmer, Sussex, for Glyndebourne Piper 4th 146992, born May 18, 1930, calved May 7, 1934; *s.* Glyndebourne Buscon 34279 P.I., *d.* Glyndebourne Piper 2nd 116538 *by* Glyndebourne (imp. 1922) Rikus 20111.

1641 II. £15.—W. Curtis & Son, Berwick Manor Farm, Rainham, Essex, for Barwyke Dewdrop 143454, born Jan. 25, 1930, calved Nov. 15, 1933; *s.* Lawford Graham 33085, *d.* Ingatestone Myrtle Dewdrop 117652 *by* Northdean Myrtle Prince 14988.

1642 III. £10.—F. W. Gilbert, The Manor, Chellaston, Derby, for Chellaston Gretel 134854, born Jan. 2, 1929, calved June 11, 1934; *s.* Thurston Karel 3rd 32005 P.I., *d.* Ingatestone Briar Gretel 94870 *by* Hache Briar Rose 25865.

1645 R.N.—Lord Rayleigh, The Bury, Hatfield Peverel, Chelmsford, for Terling Breeze 36th.

H.C.—1644.

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[1] Prizes, except Fourth and Fifth, given by the British Friesian Cattle Society.

[2] Champion Prize of £10 given by the British Friesian Cattle Society for the best Cow or Heifer.

Class 191.—*British Friesian Heifers, in-milk to first calving, born on or after January* 1, 1931.[1]

1652 I. & R.N. for Champion.[2]—George Gee, Ely Grange, Frant, Tunbridge Wells, for **Mayford Mars Hyphen 159262**, born June 28, 1931, calved May 16, 1934; *s.* Douneside Marcellus 34163, *d.* Herrington Hyphen 117230 *by* Herrington Ynte's Editor 26037.

1647 II.—F. Chandler, Someries Farm, Luton, for **Saracens Renie 161144 P.I.**, born March 14, 1931, calved May 14, 1934, bred by J. R. Upson, Rush Court, Wallingford; *s.* Saracens Meibloem Beatty 33449 P.I., *d.* Saracens Princess Eirene 120962 P.I. *by* Northdean Hollander 5th 29479 P.I.

1655 III.—J. R. Upson, Rush Court, Wallingford, for **Saracens Elsie 161126**, born April 14, 1931, calved May 18, 1934; *s.* Saracens Meibloem Beatty 33449 P.I., *d.* Moulsoe Elsie 2nd 108184 *by* Moulsoe Golden King 18087.

H.C.—1653.

Class 192.—*British Friesian Heifers, born on or between January* 1 *and June* 30, 1932.

1660 I.—The Trustees of Sir A. W. MacRobert, Bart., Douneside Home Farm, Tarland, Aberdeenshire, for **Douneside Lala 3rd 166458**, born May 27; *s.* Douneside Masterpiece 19835, *d.* Douneside Lala 126014 *by* Douneside Pel Klaas 30901 P.I.

1664 II.—G. B. Radcliffe, Pool Bank, Tarvin, Chester, for **Tarvin Winifred 172874**, born Jan. 14; *s.* Tarvin Janke's Mairschaap 33525 P.I., *d.* Tarvin Queechy 121702 *by* Mapleton Hilko's Ironclad 26511 P.I.

1656 III.—F. J. Carter, Gardeners Farm Baddow Road, Chelmsford, for **Chelmsford Chess 4th, 165204**, born Jan. 6; *s.* Thurston Karel Hisko 30033 P.I., *d.* Chelmsford Chess 124938 *by* Chelmsford Prince 28061.

1658 R.N.—F. W. Gilbert, The Manor, Chellaston, Derby, for **Harperadams Honesty 3rd.**

H.C.—1665.

Class 193.—*British Friesian Heifers, born on or between July* 1 *and December* 31, 1932.

1672 I.—Albert Weightman, Middle Herrington Farm, Sunderland, for **Herrington Hatsumer Mae 168308 P.I.**, born Oct. 20; *s.* Saracens Dennis 38055 P.I., *d.* Herrington Hatsumer 117196 P.I. *by* Wychnor Jan 24645 P.I.

1673 II.—Albert Weightman, for **Herrington Maureen 168326**, born Nov. 5; *s.* Saracens Dennis 38055 P.I., *d.* Herrington Kitty 168310 *by* Creskeld Joy's Chief 34073 P.I.

1666 III.—Major B. M. Edwards, M.C., Hardingham Hall, Norwich, for **Hardinghall Bramwell 2nd 167978**, born July 27; *s.* Sukar Cerjan Ulysses 36567, *d.* Hardinghall Meibram 105638 *by* Northdean Hollander 4th 26675 P.I.

1668 R.N.—H. G. Fulcher & Co., Aldeburgh Hall, Aldeburgh, Suffolk, for **Aldeburgh Karel Winberry.**

H.C.—1674.

Class 194.—*British Friesian Heifers, born on or between January* 1 *and June* 30, 1933.[1]

1686 I.—G. B. Radcliffe, Pool Bank, Tarvin, Chester, for **Tarvin Apple Blossom 183732**, born March 1; *s.* Tarvin Janke's Mairschaap 33525 P.I., *d.* Tarvin Sweetbriar 141880 *by* Tarvin (imp. 1922) Mazeppa 21507.

1681 II.—The Trustees of Sir A. W. MacRobert, Bart., Douneside Home Farm, Tarland, Aberdeenshire, for **Douneside Joyce 2nd 177398**, born March 28; *s.* Douneside Hatsumerschaap 2nd 32629 P.I., *d.* Douneside Mimula 136026 *by* Douneside Masterpiece 19835.

1682 III.—Piddington (Northants) Estates, Ltd., Horton, Northampton, for **Piddington Columbus Adela 182160**, born April 15; *s.* Terling Columbus 39781 P.I., *d.* Astonville Adela 2nd 100788 *by* Northdean Hollander 3rd 23845 P.I.

1687 IV.—G. B. Radcliffe, for **Tarvin Audrey 183752**, born April 4; *s.* Tarvin (imp. 1922) Mazeppa 21507, *d.* Tyddyn Klaskes Patricia 88230 *by* Tarvin Laddie 21511.

1678 V.—George Gee, Ely Grange, Frant, Tunbridge Wells, for **Mayford Mars Hermione**, born Jan. 4; *s.* Douneside Marcellus 34163, *d.* Chellaston Karel Hermione 144808 *by* Thurston Karel 30027 P.I.

1680 R.N.—Arthur J. Hill, Denton Park, Ben Rhydding, Yorks., for **Ahill Doris.**

H.C.—1685.

Class 195.—*British Friesian Heifers, born on or between July* 1 *and December* 31, 1933.[1]

1697 I.—Mrs. P. Tory, Shapwick, Blandford, for **Crawford Hope 2nd 176816**, born July 1; *s.* Crawford Bravo 35553, *d.* Crawford Hope 51706 *by* Ickenham Pensioner 9955.

1690 II.—W. Curtis & Son, Berwick Manor, Rainham, Essex, for **Barwyke Zonda Signorinetta 174788**, born July 7; *s.* Gilston Zonda's Lodewijk 34267 P.I., *d.* Gilston Ceres Signorinetta 3rd 116374 *by* Gilston Ceres 9781.

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[1] Prizes, except Fourth and Fifth, given by the British Friesian Cattle Society.

[2] Champion Prize of £10 given by the British Friesian Cattle Society for the best Cow or Heifer.

1691 III.—F. W. GILBERT, The Manor, Chellaston, Derby, for **Strode Buretta 183600**, born Oct. 26, bred by J. G. Stewart Peter, Little Compton, Moreton-in-Marsh; *s.* Gilston Spangle Excalibur 35787, *d.* Gilston Ynte's Etta 105040 *by* Gilston Sietske's Ynte 20085 P.I.

1695 R.N.—PIDDINGTON (NORTHANTS) ESTATES, LTD. Horton Northampton, for **Piddington Mystic.**

H.C.—1694.

1618, 1672, 1673 **Gold Medal.**[1]—ALBERT WEIGHTMAN, for **Ardrossan Glossie, Herrington Hatsumer Mae and Herrington Maureen.**

1664, 1686, 1687 **Trophy**[2] **& R.N. for Gold Medal.**[1]—G. B. RADCLIFFE, for **Tarvin Winifred, Tarvin Apple Blossom and Tarvin Audrey.**

1573, 1605, 1660 **R.N. for Trophy.**[2]—THE TRUSTEES OF SIR A. W. MACROBERT, Bart., for **Douneside Marcellus 2nd, Douneside Laurimar and Douneside Lala 3rd.**

Ayrshires.

Class 196.—*Ayrshire Bulls, born before September* 1, 1932.

1703 I.—NATIONAL SOCIETY FOR EPILEPTICS, Chalfont Colony, Bucks., for **Valleyfield Favourite 31168**, born Jan. 9, 1931, bred by John Forsyth, Valleyfield, Stranraer; *s.* Sandhill Milk Boy 26427, *d.* Valleyfield Brownie 5th 2709 *by* Hobsland Lucks All 21133.

1698 II.—JOHN BONE, Sheepcotes, Little Waltham, Chelmsford, for **Rottenrow Milkman 33912**, born March 11, 1932, bred by Jacob Templeton, Rottenrow, Mauchline; *s.* Netherhall Response 30535, *d.* Willoxton Wee Missie 2nd 11652 *by* Hobsland Milk Boy 24341.

1702 III.—JOHN LOGAN, Beauchamps, Wyddiall, Buntingford, for **Meadowbank Attraction 33451**, born Jan. 2, 1932; *s.* Bargenoch Last Ray 29454, *d.* Bargenoch Milky Way 27399 *by* Bargenoch Stand Aside 23819.

Class 197.—*Ayrshire Bulls, born on or after September* 1, 1932.

1707 I.—A. W. MONTGOMERIE, Westburn Farm, Cambuslang, for **Westburn Boy Blue 33960**, born Feb. 23, 1933; *s.* Bargenoch Blue Ribbon 31923, *d.* Harleyholm Butterfly 9th 10929 *by* Lessnessock Replica 22955.

1706 II.—JOHN LOGAN, Beauchamps, Wyddiall, Buntingford, for **Meadowbank Bright Boy 33458**, born Oct. 11, 1932; *s.* Overton Rustler 31958, *d.* Bargenoch Lady Treasure 5632 *by* Low Milton Archer 23019.

1704 III.—ALEXANDER COCHRANE, Nethercraig, Kilmarnock, for **Chapelhill Buster 33140**, born March 7, 1933, bred by Robert Dunlop, Chapelhill, Castle Douglas; *s.* Netherhall Reliable 31197, *d.* Chapelhill Charlotte 45782 *by* Auchenbrain Silver Wood 16949.

Class 198a.—*Ayrshire Cows, in-milk, born on or before September* 1, 1931.

1735 I.—A. W. MONTGOMERIE, Westburn Farm, Cambuslang, for **Chapelhill Cissy 3rd 409**, born Jan. 13, 1925, calved May 14, 1934, bred by James Wallace, Chapelhill, Castle Douglas; *s.* Auchenbrain Royal Blood 17544, *d.* Chapelhill Cissy 69205 *by* Chapelhill Eversure 15359.

1738 II.—NATIONAL SOCIETY FOR EPILEPTICS, Chalfont Colony, Bucks., for **Chalfont Damson 17304**, born Dec. 29, 1927, calved June 7, 1934; *s.* Ballochmartin Lord Sterlie 27123, *d.* Ballochmartin White Rose 2nd 10783 *by* Glenacre Renown 23115.

1722 III.—ESHOTT PEDIGREE STOCK FARMS, Felton, Northumberland, for **Eshott Princess 10704**, born March, 9 1926, calved June 13, 1934; *s.* Howie's Eminent 16973, *d.* Mainhill Princess 7th 84900 *by* Millantae Perfection 17876.

1726 R.N.—J. R. P. HEDLEY, Southcote Grange Farm, Reading, for **Hartburn Rena.**

Class 198b.—*Ayrshire Cows, in-calf, born on or before September* 1, 1931.

1717 I. & **R.N. for Champion.**[3]—ROBERT CROSS, Knockdon, Maybole, Ayrshire, for **Knockdon Noel 24420**, born May 20, 1929; *s.* Dalgig King George 25804, *d.* Knockdon Nina 2nd 2083 *by* Knockdon Norman 23802.

1742 II. & **R.N. for Champion.**[4]—GEORGE TEMPLETON, Carnell Home Farm, Hurlford, Ayrshire, for **Carnell Snowdrop 2nd 33501**, born Dec. 26, 1929; *s.* Carnell Footprint 26468, *d.* Catcraig Snowdrop 61029 *by* Howie's Grey Daylight 15283.

1728 III.—A. & A. KIRKPATRICK, Barr, Sanquhar, for **Barr Kindle 13467**, born Jan. 30, 1927; *s.* Barr Here Goes 24536, *d.* Barr Honey 94817 *by* Drumsuie Gaiety 13250.

1730 IV.—D. MACKAY, Symonds Hyde, Hatfield, for **Blackbyres Princess 3rd 26930**, born April 24, 1929, bred by A. & J. Marr, Blackbyres, Maybole; *s.* Muirlaught Prince 26958, *d.* Blackbyres Princess 2nd 7061 *by* Blackbyres Bobby 23305.

C.—1713.

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[1] Gold Medal given through the British Friesian Cattle Society for the best group of three Cows or Heifers.

[2] Perpetual Bronze Challenge Trophy given by the Friesland Cattle Breeders' Association of South Africa for the best group of three animals bred by Exhibitor.

[3] The "Cowhill" Silver Challenge Cup given through the Ayrshire Cattle Herd Book Society for the best Ayrshire.

[4] The "Oldner" Silver Challenge Cup given through the Ayrshire Cattle Herd Book Society for the best Cow or Heifer.

Class 199a.—*Ayrshire Heifers, in-milk, born after September* 1, 1931, *and before September* 1, 1932.[1]

1760 I., Champion[2] & Champion.[3]—ROBERT SILLARS & SON, Ickham Court, Canterbury, for Ickham Bessie 12th 44182, born Oct. 2, 1931, calved June 20, 1934; *s.* Linnhead Pearl Prince 29037, *d.* Ickham Bessie 4th 19860 *by* Ickham Foundation 27011.

1762 II.—ROBERT SILLARS & SON, for Ickham Juno 4th 49717, born Oct. 5, 1931, calved July 2, 1934; *s.* Linnhead Pearl Prince 29037, *d.* Ickham Juno 2nd 19882 *by* Ickham Foundation 27011.

1763 III.—ROBERT SILLARS & SON, for Ickham Milkmaid 4th 49727, born Oct. 29, 1931, calved June 18, 1934; *s.* Linnhead Pearl Prince 29037, *d.* Ickham Milkmaid 2nd 19884 *by* Ickham Foundation 27011.

Class 199b.—*Ayrshire Heifers, in-calf, born after September* 1, 1931, *and before September* 1, 1932.[1]

1752 I.—ESHOTT PEDIGREE STOCK FARMS, Felton, Northumberland, for Eshott Joyous 45829, born Oct. 4, 1931; *s.* South Craig Butter Fat 28148, *d.* Knockterra Joyce 12104 *by* Low Milton Donald 25442.

1749 II.—ALEXANDER COCHRANE, Nether Craig, Kilmarnock, for Nether Craig Billow 47578, born Sept. 4, 1931; *s.* Nether Craig Select 28030, *d.* Nether Craig Bina 16687 *by* Hobsland Lucky Boy 10482.

1755 III.—JOHN LOGAN, Beauchamps Wyddiall, Buntingford, for Meadowbank Agnes 54265, born Feb. 26, 1932; *s.* Bargenoch Last Ray 29454, *d.* Bargenoch Miss Colla 27400 *by* Bargenoch Stand Aside 23819.

Class 200.—*Ayrshire Heifers, born on or after September* 1, 1932.

1771 I.—A. W. MONTGOMERIE, Westburn Farm, Cambuslang, for Westburn Daisy 48541, born March 5, 1933; *s.* Bargenoch Blue Ribbon 31239, *d.* Round Bush Denty B 5th 14925 *by* Roundbush Royal Blood 25305.

1764 II.—JOHN BONE, Sheepcotes, Little Waltham, Chelmsford, for Mains of Park Lively 49963, born Jan. 28, 1933; *s.* Overlaw Royal 23192, *d.* Mains of Park Lady Craigie 820 *by* Mains of Park Pioneer 24369.

1772 III.—NATIONAL SOCIETY FOR EPILEPTICS, Chalfont Colony, Bucks., for Chalfont Martha 48129, born Nov. 10, 1932; *s.* Auchenbrain Revelation 30408, *d.* Powillimount Martha 7th 25723 *by* Cowhill Landlord 27133.

Guernseys.

N.B.—Unless otherwise stated the numbers refer to the English Guernsey Herd Book.

Class 201.—*Guernsey Bulls, born in or before* 1931.

1781 I., Champion[4] & Champion.[5]—MRS. HOWARD PALMER, Heathlands, Wokingham, for Christmas Delight of Maple Lodge 8037, fawn and white, born Dec. 25, 1928, bred by E. P. Mahy, Maple Lodge, Vale, Guernsey; *s.* Valentine's Galore of Maple Lodge 5437 P.S., *d.* 18911 P.S. Claras Delight of Maple Lodge *by* Sequel's Delight 2442 P.S.

1777 II., R.N. for Champion[4] & R.N. for Champion.[5]—CAPT. COSMO DOUGLAS, Hazelby, Newbury, for Medora's Boy 7853, dark fawn, born May 20, 1929, bred by F. J. Torode, La Houguette, Castel, Guernsey; *s.* Dairyman 5th des Vallees 5462 P.S., *d.* 22892 P.S. Medora of La Houguette *by* Governor of Myrtle Place 5th 5445.

1779 III.—EDWARD GERRISH, Carrallack House, St. Just, Cornwall, for Valerie's Honour 9008, fawn and white, born Nov. 8, 1925, bred by W. B. Langlois, Les Caches, St. Peters-in-the-Wood, Guernsey; *s.* Lady's Honour 4833 P.S., *d.* 19137 P.S. Valerie of Caches Farm *by* Polly's Governor des Ruettes 3906 P.S.

1774 IV.—MRS. JOAN K. BATESON, Lucas Green Manor, West End, Chobham, for Athene's Lad 9342, dark fawn and little white, born April 26, 1931, bred by Country Hospital, Castel, Guernsey; *s.* May Rose Lad 4th of the Spurs 5257 P.S., *d.* 17391 P.S. Athene 3rd *by* Heaume's Sailor Boy 3717 P.S.

1784 R.N.—R. C. VAUGHAN, Bushbury, Blackboys, Sussex, for Bushbury Surprise.
H.C.—1776, 1782. C.—1780, 1783.

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[1] Prizes given by the Ayrshire Cattle Herd Book Society.
[2] The "Cowhill" Silver Challenge Cup given through the Ayshire Cattle Herd Book Society for the best Ayrshire.
[3] The "Oldner" Silver Challenge Cup given through the Ayshire Cattle Herd Book Society for the best Cow or Heifer.
[4] Champion Prize of £5 given by the English Guernsey Cattle Society for the best Bull.
[5] The "Calehill" Silver Challenge Cup given by the English Guernsey Cattle Society for the best Bull.

Class 202.—*Guernsey Bulls, born in* 1932.

1788 I.—Dame Ethel Locke King, Brooklands Farm, Weybridge, for **Shiwa Chérie's Quickly's Lad 9511**, fawn and white, born May 1; *s.* Shiwa Primrose Lad's Quickly 7519, *d.* 26058 Ivy's Chérie *by* Honoria's Sequel Slogan 4845 P.S.

1794 II.—J. G. Watkins, Lodge Farm, Foxhall, Ipswich, for **Bealings Primrose's Bellfounder 9413**, fawn, born March 3, bred by Mrs. Edith Howe, Bealings, Suffolk; *s.* Benhall Vice President 7959, *d.* 31699 Bealings Remembrance *by* Bealings Rose's Masterpiece 7179.

1786 III.—Capt. Cosmo Douglas, Hazelby, Newbury, for **Meadow Sweet's Royal Fancy of Hazelby 10448**, fawn, born July 26; *s.* Caruso's Fancy of Hazelby 8576, *d.* 24856 Hazelby Meadow Sweet *by* Hindhead Robert 4th 5488.

1792 IV.—Capt. J. B. Scott, Rotherfield Park, Alton, Hants., for **Brookhill Midshipman 9471**, fawn and white, born Jan. 30, bred by Mrs. D. S. L. Verschoyle, Brookhill, Wokingham; *s.* Brookhill Seigneur's Sequence 8389, *d.* 32126 Dorothy de la Seigneurie *by* Slogan's Primrose Sequel 5341 P.S.

1787 R.N.—Sir H. Goschen, Bart., Durrington Farm, Harlow, for **Durrington May Bird 4th.**

H.C.—1789. C.—1793.

Class 203.—*Guernsey Bulls, born in* 1933.

1802 I.—Carl Holmes, Clover Top Farm, Codicote, Hitchin, for **Ironside 6th of Clover Top 10049**, fawn and white, born Jan. 9; *s.* Ironside of les Chevaliers 8181, *d.* 31439 May Rose of Clover Top *by* May Rose Cherub of the Spurs 7729.

1808 II.—Eric H. Rose, Leweston Manor, Sherborne, Dorset, for **Leweston Rose Lad 6th 10529**, fawn and white, born July 3; *s.* Leweston Rose Lad 7790, *d.* 29320 Lady Easter of La Rue *by* Sam of Le Fort 4409 P.S.

1795 III.—The Exors of Sir Louis Baron, Bart., Holmbury House, Holmbury St. Mary, Dorking, for **Tregonning Cornishman 10192**, fawn and white, born June 4, bred by George Blight, Tregonning, Breage, Helston; *s.* Tregonning May Boy 8953, *d.* 31105 Tregonning Jane 12th *by* Tregenna May Bird 4961.

1799 IV.—W. Dunkels, Fernhill Park, Windsor Forest, for **Fernhill Robert 7th 9985**, fawn and little white, born March 15; *s.* Fernhill Robert 5th 7795, *d.* 28842 Fernhill Loulou 3rd *by* Downe Valentine's Honour of Vimiera 2nd 4770.

1798 V.—W. Dunkels, for **Bealings Kismet 10022**, fawn and white, born April 15, bred by Mrs. Edith Howe, Bealings, Suffolk, *s.* Benhall Vice President 7959, *d.* 19529 Bealings Rose 7th *by* Raymond of Carteret 2nd 3783.

1807 R.N.—Mrs. J. Sutcliffe Pyman, Norsebury, Sutton Scotney, Hants., for **Norsebury Rosey's Lodestar 2nd.**

H.C.—1796, 1801, 1804. C.—1805, 1809.

Class 204.—*Guernsey Cows, in-milk, born in or before* 1929.

1816 I., Champion[1] & Champion.[2]—Capt. Cosmo Douglas, Hazelby, Newbury, for **27826 Hazelby Sunshine**, fawn and white, born Feb. 17, 1928, calved April 20, 1934; *s.* Hindhead Robert 4th 5488, *d.* 23213 Poltimore Ursula 2nd *by* Pengellys Boy's Sequel 4893.

1817 II.—W. Dunkels, Fernhill Park, Windsor Forest, for **28077 Fernhill Rose 2nd**, fawn and white, born March 28, 1928, calved April 28, 1934; *s.* Hindhead Robert 6th 5847, *d.* 18813 Fernhill Rose *by* Murrell Desmond 4263.

1819 III.—C. C. Empson, Valley Farm, Sproughton, Ipswich, for **21428 Le Grand Marais Violet 2nd**, fawn and white, born March 18, 1923, calved May 6, 1934, bred by E. Martel, Le Grand Marais, Castel, Guernsey; *s.* Rex of Myrtle Place 4523 P.S., *d.* 18944 P.S. Le Grand Marais Violet *by* Gold Link of the Gree 3973 P.S.

1823 IV.—Mrs. Howard Palmer, Heathlands, Wokingham, for **31545 Rosey of Goodnestone 46th**, fawn and white, born Aug. 4, 1929, calved April 3, 1934, bred by Lord Fitzwalter, Goodnestone Park, Canterbury; *s.* Sequel's Slogan 2nd 4311, *d.* 22421 Rosey of Goodnestone 26th *by* Sequel's Delight 2nd 3403.

1832 V.—J. G. Watkins, Lodge Farm, Foxhall, Ipswich, for **32027 Foxhall Joyce**, dark fawn and white, born Dec. 9, 1929, calved Nov. 24, 1933; *s.* Cara's Dimple of Duvaux 7130, *d.* 27624 Hockly Jennie *by* Godwins Winter King 6165.

1818 R.N.—H. A. Y. Dyson, Daltons, Haywards Heath, for **Primrose of Pothill.**

H.C.—1821, 1825. C.—1824, 1827.

Class 205.—*Guernsey Cows or Heifers, in-milk, born in* 1930 *or* 1931.[3]

1839 I., R.N. for Champion[1] & R.N. for Champion.[2]—Mrs. Edith Howe, Bealings, Suffolk, for **35271 Bealings Christmas Rose**, fawn and white, born Jan. 30, 1931, calved May 24, 1934; *s.* Bealings Rose's Masterpiece 7179, *d.* 16091 Bealings Rose 4th *by* Gurlyn John 3529.

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[1] Champion Prize of £5 given by the English Guernsey Cattle Society for the best Cow or Heifer.

[2] The "Fernhill" Silver Challenge Cup given by the English Guernsey Cattle Society for the best Cow or Heifer.

[3] Prizes, except Fourth, given by the English Guernsey Cattle Society.

1837 II.—W. DUNKELS, Fernhill Park, Windsor Forest, for 35901 **Fernhill Rose 5th**, fawn and white, born April 20, 1931, calved May 9, 1934; *s.* Lavender's Slogan of La Hougue 7839, *d.* 28077 Fernhill Rose 2nd *by* Hindhead Robert 6th 5847.
1834 III.—CAPT. COSMO DOUGLAS, Hazelby, Newbury, for 35908 **Hazelby Honoria**, fawn and white, born May 4, 1931, calved March 16, 1934; *s.* Candie's Queen's Fancy 7347, *d.* 25803 Princess 2nd of Chute Standen *by* Clatford Maitre du Moulin 5466.
1843 IV.—MRS. HOWARD PALMER, Heathlands, Wokingham, for 33320 **Murrell Diadem**, fawn and white, born May 4, 1930, calved May 3, 1934; *s.* Murrell Rose Lad 7194, *d.* 24057 Murrell Damby *by* Nelly's Fancy 4886.
1835 **R.N.—CAPT. COSMO DOUGLAS for 34340 Meadow Sweet 5th of Shute Standen.**
H.C.—1845. C.—1846.

Class 206.—*Guernsey Heifers, born in* 1932.

1847 I.—THE EXORS. OF SIR LOUIS BARON, Bart., Holmbury House, Holmbury St. Mary, Dorking, for 48924 **Hewton Lodge Dorine 4th**, fawn and white, born Feb. 21, bred by T. Nicolle, Hewton Lodge, Castel, Guernsey; *s.* Candie's Cornet 5563 P.S., *d.* 24516 P.S. Hewton Lodge Dorine *by* Governor of Myrtle Place 4337 P.S.
1857 II.—CAPT. HAROLD J. PILBROW, Mapleton, Edenbridge, for 38314 **Jaonnets Queen of Mapleton**, fawn and white, born Jan. 15; *s.* Gaddesden Rosey's Sequel 7988, *d.* 34497 Jaonnets Queen *by* Nonpareil of Maple Lodge 5092 P.S.
1852 III.—CAPT. C. J. KANE, Kingston Russell House Farm, Long Bredy, Dorchester, for 38418 **Kingston Russell Jessamine**, fawn and white, born Jan. 11; *s.* Milton Rose Lad 4th 7723, *d.* 34221 Tackler of Brickfield.
1858 IV.—MRS. J. SUTCLIFFE PYMAN, Norsebury, Sutton Scotney, Hants., for 38654 **Rosey 8th of Rusper**, fawn and white, born March 11, bred by W. A. Argent, Ghyll Manor, Rusper; *s.* Wintergreen's Sequel of Rusper 7148, *d.* 22421 Rosey of Goodnestone 26th *by* Sequel's Delight 2nd 3403.
1850 V.—CARL HOLMES, Clover Top Farm, Codicote, Hitchin, for 38484 **Rosey of Goodnestone 62nd**, fawn and white, born Feb. 1, bred by Lord FitzWalter, Goodnestone Park, Canterbury; *s.* Rosey's Slogan 3rd of Goodnestone 7774, *d.* 31844 Rosey of Goodnestone 49th *by* Honoria's Advocate 5286.
1862 R.N.—W. G. TROWER, Stanstead Bury Farm, Stanstead Abbotts, Herts., for **Stanstead Princess 7th.**
H.C.—1849, 1856. C.—1863, 1864.

Class 207.—*Guernsey Heifers, born in* 1933.

1869 I.—W. DUNKELS, Fernhill Park, Windsor Forest, for 42145 **Fernhill Victorine 9th**, fawn and white, born June 11; *s.* Fernhill Robert 5th 7795, *d.* 36338 Fernhill Victorine 7th *by* Lavender Slogan of La Hougue 7839.
1886 II.—CAPT. L. REGINALD WAUD, Bradley Court, Chieveley, Newbury, for 42027 **Bradley Buttermaid 5th**, fawn and white, born May 26; *s.* Firebrand of Marsh Close 8088, *d.* 34840 Bradley Buttermaid 3rd *by* Tregothnan Farmer 6248.
1876 III.—CAPT. HAROLD J. PILBROW, Mapleton, Edenbridge, for 41996 **Moss Gay 4th of Mapleton**, fawn and white, born May 19; *s.* Sequel's Optimist 2nd 9075, *d.* 28282 Moss Gay 2nd of Bourg View *by* Ibraham Ali 4942 P.S.
1882 IV.—H. B. TURNER, Malverleys, Newbury, for 41955 **Malverleys Daffodil 3rd**, fawn and white, born May 27; *s.* Bladen Rose Lad 8th 9111, *d.* 32104 Malverleys Daffodil *by* Tregothnan Farmer 6243.
1870 V.—H. A. Y. DYSON, Daltons, Haywards Heath, for 42467 **Daisy of Payhay**, fawn and white, born May 8; *s.* Dissiford Viking 8559, *d.* 20295 Gaskins Daisy 8th *by* Poltimore President 4576.
1866 R.N.—RICHARD HAROLD BRITTAIN, Gulpher, Felixstowe, for **Gulpher Rouge of Vimiera.**
H.C.—1871, 1875, 1879. C.—1872, 1874, 1884.

Jerseys.

N.B.—***In the Jersey Classes, the number inserted within brackets after the name of an animal indicates the number of such animal in the Island Herd Book. A number without brackets indicates that the animal is registered in the English Jersey Herd Book.***

Class 208.—*Jersey Bulls, born in or before* 1931.

1892 I.—SIR HAROLD MACKINTOSH, Conyngham Hall, Knaresborough, for **Joubert 16587**, whole colour, born May 27, 1928, bred by Lady Estella Hope, South Park, Bodiam, Sussex; *s.* Purple Emperor 16066, *d.* 643 Jolie *by* Ecclesden Peter 18556.
1897 II.—MISS G. M. YULE, Hanstead House, Bricket Wood, St. Albans, for **Wotton Lucky Flier 17972**, whole colour, born June 21, 1930, bred by Mrs. Evelyn, Wotton House, Dorking; *s.* Wotton Airman 2nd 14502, *d.* 9292 Felixstowe *by* Silver's Pride Gamboge 16656.
1893 III.—BRIG.-GEN. F. C. MORE-MOLYNEUX, C.M.G., D.S.O., Loseley Park, Guildford, for **Lingen Sweep Time 15523**, whole colour, born June 9, 1924, bred by Col. L. G. Gisborne, C.M.G., Lingen Hall, Brampton Bryan; *s.* The Sweep 14144, *d.* Thyme *by* Lucy's Gem 13342.
1891 **R.N.—MRS. A. M. JOSSELYN, New Hall, Ardleigh, Colchester, for Diamond's Prince.**
H.C.—1889, 1890, 1895. C.—1896.

Class 209.—*Jersey Bulls, born in* 1932.

1911 I. & Champion.[1]—William E. Press, Wolvers, Reigate, for Wolvers Rufus 17968, whole colour, born May 14; *s.* Hook Cæsar 17198, *d.* 9717 Margawse *by* Palatine's Observer 15400.
1899 II.—Mrs. G. J. Caddey, Manor House, Egham, Surrey, for Egham Jester 17698, whole colour, born July 31; *s.* Daisy's Bright Pioneer 18006, *d.* 18474 Jester's Beauty *by* Royal Jester 16648.
1903 III.—Mrs. Frank Hilder, Huskards, Ingatestone, for Fryerning Tom Tit 17722, whole colour, born May 24; *s.* Morpeth's Prince 16924, *d.* 12147 Blue Tit *by* Seymour Duke 15899.
1901 IV.—Sir Harry Hague, 184 Queen's Gate, London, S.W.7, for Liberty 17787, whole colour, born May 5, bred by Mrs. G. J. Austin, Ellern Mede, Totteridge; *s.* Unabashed 17574, *d.* 13673 Lunuva *by* Majestic 15885.
1910 R.N.—W. W. Otter-Barry, Horkesley Hall, Colchester, for Ruby's Golden Boy.
H.C.—1902, 1905, 1907. C.—1900, 1908, 1912.

Class 210.—*Jersey Bulls, born in* 1933.

1925 I. & R.N. for Champion.[1]—Sir John B. Lloyd, Foxbury, Stone Street, Sevenoaks, for Rosebay's X, nearly whole colour, born Jan. 1, bred by R. J. Baudains, Trinity, Jersey; *s.* X of Oaklands 18099, *d.* (36394) Pioneer's Rosebay *by* Pioneer of Oaklands 16058.
1918 II.—Sir Harry Hague, 184 Queen's Gate, London, S.W., for Ovaltine Wonderful Lad 18353, whole colour, born April 28, bred by A. Wander, Ltd., Abbots Langley, Herts.; *s.* Design's Fern's Oxford Junior 18008, *d.* 21800 Wonderful Sultana *by* Wonderful Standard 16207.
1928 III.—J. Pierpont Morgan, Wall Hall, Aldenham, Watford, for Aldenham Ixia's Little Lad 18103, whole colour, born April 27; *s.* Ixia's Little Prince 17215, *d.* 9256 Fairseat Little Lady *by* Mantle's Favourite 15063.
1920 IV.—Lady Violet Henderson, Buscot Park, Faringdon, for The Wizard 18417, whole colour, born July 19; *s.* Wotton Hustler 16500, *d.* 12461 Circe *by* The Slasher 14143.
1936 V.—Miss G. M. Yule, Hanstead House, Bricket Wood, St. Albans, for Lucifer 18312, whole colour, born April 26, bred by Mrs. G. J. Austin, Ellern Mede, Totteridge; *s.* Unabashed 17574, *d.* 13673 Lunuva *by* Majestic 15885.
1929 R.N.—Capt. and Mrs. V. Morse, Upper Cowden, Five Ashes. Sussex, for Cowden Gipsy Prince.
1927 C. & Cup.[2]—Brig.-Gen. F. C. More-Molyneux, C.M.G., D.S.O., Loseley Park, Guildford, for Loseley Starbrook's Sweep 18311, whole colour, born March 21; *s.* Lingen Sweep Time 15523, *d.* 13633 Loseley Starbrook *by* Loseley Morning Star 16187.
1916 C. & R.N. for Cup.[2]—Wallace Elliot, for Wotton Beau Rivage.
H.C.—1913, 1914, 1930, 1932, 1935. C.—1919, 1923, 1926, 1931, 1933.

Class 211.—*Jersey Cows, in-milk, born in or before* 1930.

1942 I., Champion[3] & Special I.[4]—Mrs. Evelyn, Wotton House, Dorking, for 4282 Wotton May Moon, broken colour, born June 19, 1923, calved March 13, 1934; *s.* Henbury Moonlight 13301, *d.* Wotton Pink May *by* Red Cloud 11818.
1939 II., R.N. for Champion[3] & Special II.[4]—A. W. Ruggles Brise, Spains Hall, Braintree, for 9508 Ivy 5th, whole colour, born Dec. 22, 1926, calved May 29, 1934; *s.* Lingen Sweep Time 15523, *d.* Ivy *by* Minorca's Jolly Sultan 12076.
1954 III.—Sir John B. Lloyd, Foxbury, Stone Street, Sevenoaks, for 18340 Arkona's Viscountess, broken fawn, born March 18, 1929, calved April 15, 1934, bred by J. A. Romeril, St. Peters, Jersey; *s.* Floral Dance's You'll Do 16568, *d.* (26642) Arkona 4th *by* April Wonder 12826.
1955 IV.—Sir John B. Lloyd, for Dreaming Fleckie Lass, broken fawn, born May 31, 1930, calved March 26, 1934, bred by Mrs. E. Mauger, St. Lawrence, Jersey; *s.* Dreaming Pioneer 16714 *d.* (35563) Fleckie Lass *by* Lily's Pride King 15048.
1959 V.—Gordon McWilliam, Dunwood Manor Farm, Romsey, Hants., for 18653 Bart's Volunteeress, whole fawn, born March 8, 1929, calved Feb. 11, 1934, bred by P. C. Queree, Trinity, Jersey; *s.* Sporting Volunteer 16970, *d.* (33825) Bart of Les Platons *by* Ida's Roseboy 13982.
1964 R.N. & R.N. for Specials.[4]—H. S. Mountain, Groombridge Place, Kent, for Sir Laurence's Imogen.
H.C.—1941, 1943, 1947, 1952, 1956, 1960, 1963, 1965, 1968, 1969, 1973. C.—1940, 1950, 1951, 1972, 1976.

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[1] Champion Prize of £5 given by the English Jersey Cattle Society for the best Bull.
[2] The "Meridale" Perpetual Silver Challenge Cup given through the English Jersey Cattle Society for the best yearling Bull from recorded dam.
[3] Champion Prize of £5 given by the English Jersey Cattle Society for the best Cow or Heifer.
[4] Special Prize of £10 (First Prize) and £5 (Second Prize) given by the English Jersey Cattle Society for the best Cows or Heifers in Classes 211 to 213, bred by Exhibitor, and milked out to the Judge's satisfaction before being judged.

Class 212.—*Jersey Heifers, in-milk, born in* 1931.

1985 I.—SIR HAROLD MACKINTOSH, Conyngham Hall, Knaresborough, for 18052 **Golden Bessie**, whole colour, born May 11, calved May 24, 1934, bred by the Hon. Mrs. Esme Smyth, Ashton Court, Long Ashton; *s.* Kingston Golden Sultan 16894, *d.* 12092 Bessie *by* Novikoff 15890.

1993 II.—FRANCES COUNTESS OF WARWICK, Easton Lodge, Dunmow, Essex, for 18537 **Miss Dreaming Lady**, whole colour, born Feb. 18, calved June 16, 1934, bred by C. F. Menard, St. Brelade, Jersey; *s.* Dreaming Bob 16436, *d.* (32820) Miss Farewell Lady *by* Cowslip's Farewell 18004.

1979 III.—SIR HARRY HAGUE, 184 Queen's Gate, London, S.W. for (42289) **Queen's Dream Lady**, broken colour, born Feb. 25, calved May 12, 1934, bred by J. P. Merket, St. Saviours, Jersey; *s.* Xias Dreamer (6538), *d.* (36670) Queen's March Lady *by* Standard of Oaklands (6071).

1988 IV.—M. F. NORTH, Allangate, Rustington, Sussex, for 18465 **Kentwins Katisha**, broken colour, born May 16, calved May 3, 1934, bred by H. C. Pelly, Venars, Nutfield; *s.* Kentwins Poppy's Aroma 16453, *d.* 8042 Kentwins Cynthia *by* Wotton Airman 2nd 14502.

1980 R.N.—SIR HARRY HAGUE, for **Vert Champ Hamlet Beauty**.

H.C.—1978, 1982, 1987. C.—1981, 1992.

Class 213.—*Jersey Heifers, in-milk, born in* 1932.[1]

2002 I.—SIR HARRY HAGUE, 184 Queen's Gate, London, S.W., for **Surville Scorcher's Present**, whole colour, born April 5, calved April 8, 1934, bred by G. A. Romeril, St. Helier, Jersey; *s.* Surville Scorcher (6695), d. (34319) New Year's Present *by* Dreaming Sultan (5880).

2003 II.—LADY VIOLET HENDERSON, Buscot Park, Faringdon, for 17159 **Mavourneen**, whole colour, born June 27, calved June 13, 1934; *s.* Wotton Hustler 16500, *d.* 11051 Irish Witchery *by* June's Sybil Oxford 16011.

1999 III.—MRS. EVELYN, Wotton House, Dorking, for 18266 **Wotton Belinda**, whole colour, born May 18, calved May 6, 1934; *s.* Wotton Sunbell 17465, *d.* 18269 Wotton Betsinda *by* Wotton Airman 2nd 14502.

2001 R.N.—SIR HARRY HAGUE, for **Edna Brampton Belle**.

H.C.—1996, 2006. C.—1997, 2007.

Class 214.—*Jersey Heifers, born in* 1933.

2015 I.—SIR HARRY HAGUE, 184 Queen's Gate, London, S.W., for 18809 **Bashful Ruby**, whole colour, born May 2, bred by Mrs. G. J. Austin, Ellern Mede, Totteridge; *s.* Unabashed 17574, *d.* 5574 Ruby Golden *by* Golden Orb 15005.

2017 II.—LADY VIOLET HENDERSON, Buscot Park, Faringdon, for 20839 **Scotch Express**, whole colour, born April 30; *s.* Hustler's Count 17207, *d.* 16912 Lady Inverclyde *by* Fiery Aristocrat 16280

2028 III.—WILLIAM E. PRESS, Wolvers, Reigate, 21319 **Wolvers Dolly's Lassie**. whole colour, born March 15; *s.* Hook Cæsar 17198, *d.* 3396 Harmonious Doll *by* Gate's Knight 18575.

2035 IV.—MISS G. M. YULE, Hanstead House, Bricket Wood, St. Albans, for 20667 **Primavera**, whole colour, born July 25; *s.* Wotton Lucky Flier 17972, *d.* 17534 Primula *by* Haseley Pirate 15668.

2022 V.—SIR HAROLD MACKINTOSH, Conyngham Hall, Knaresborough, for 19236 **Conyngham De Luxe**, whole colour, born May 22; *s.* Danbury It's Meadowsweet 17090, *d.* 18052 Golden Bessie *by* Kingston Golden Sultan 16894.

H.C.—2018, 2021, 2029, 2031, 2038. C.—2019, 2020, 2024, 2026.

Cup.[2]—SIR HARRY HAGUE.

R.N. for Cup.[2]—SIR JOHN B. LLOYD.

Kerrys.

N.B.—In the Kerry Classes, the number inserted within brackets after the name of an animal indicates the number of such animal in the Royal Dublin Society's Herd Book. A number without brackets indicates that the animal is registered in the British Kerry Herd Book.

Class 215.—*Kerry Bulls, born in or before* 1932.

2037 I. & Champion.[3]—H. E. MITCHELL, Great Pellingbridge Farm, Scaynes Hill, Haywards Heath, for **O. P. H. Pailful Curley** 848, born June 8, 1929, bred by Capt. R. E. Palmer, Newdigate, Surrey; *s.* Pailful Jim of O.P.H. 772, *d.* Elmhurst Cresta 8569 *by* Valencia Linksman 496.

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[1] Prizes given by the English Jersey Cattle Society.

[2] The "Conyngham" Perpetual Silver Challenge Cup given through the English Jersey Cattle Society for the most points awarded in a combination of entries.

[3] Silver Challenge Cup given by the British Kerry Cattle Society for the best Kerry.

2039 II.—BERTRAM W. A. WATNEY, Brookwood Corner, Holmwood, Surrey, for **Cheselbourne Gabriel 881**, born Jan. 8, 1930, bred by Mrs. Freeland, Cheselbourne Manor, Dorchester; *s.* Valencia Minstrel 1667, *d.* Cheselbourne Garland 4328 *by* Dew Demon 640.
2038 III.—H. H. WARDELL, Pulpits Farm, Hockley, Essex, for **Drumgaunagh Aga Khan 948**, born March 21, 1931, bred by the Kerry Cow Dairy Farms, Layer-de-la-Haye; *s.* Valencia Linksman 496, *d.* Drumgaunagh Agnes 3836 *by* Drumgaunagh Victory 508.
2036 R.N.—THE KERRY COW DAIRY FARMS, Layer-de-la-Haye, Colchester, for **Drumgaunagh Doric.**

Class 216.—*Kerry Bulls, born in* 1933.

2042 I.—BERTRAM W. A. WATNEY, Brookwood Corner, Holmwood, Surrey, for **Brookwood Egbert 963**, born Aug. 5; *s.* Cheselbourne Gabriel 881, *d.* Montalto Kathlina of O.P.H. 4168 *by* North Star of Carton 516.
2040 II.—H. E. MITCHELL, Great Pellingbridge Farm, Scaynes Hill, Haywards Heath, for **Valencia Roland 975**, born Jan. 28, bred by Sir John FitzGerald, Bart., The Warren House, Stanmore; *s.* Ard Caein Majestic 875, *d.* Valencia Ruth 4816 *by* Elmhurst Excellency 687.
2041 III.—NEWTON R. STEEL, The Hookland Estate, Scaynes Hill, Haywards Heath, for **Hookland Desmond**, born Jan. 17; *s.* Valencia Minstrel 667, *d.* Valencia Nannie 3236 *by* Czar of Carton 506.

Class 217.—*Kerry Cows, in-milk, born in or before* 1930.

2048 I. & R.N. for Champion.[1]—BERTRAM W. A. WATNEY, Brookwood Corner, Holmwood, Surrey, for **Minley Kathleen 4389**, born June 2, 1925, calved May 31, 1934, bred by Laurence Currie, Minley Manor, Farnborough; *s.* Hattingley Arthur 588, *d.* Minley Mione 3418 *by* Sloe Drop 415.
2047 II.—NEWTON R. STEEL, The Hookland Estate, Scaynes Hill, Sussex, for **Gort Tulip 4939**, born May 21, 1924, calved May 10, 1934, bred by V. E. Rattray, Gortnaskehy, Ballybunion; *s* Pallas Rover 659, *d.* Bushmount Hawthorne 4892 *by* Pallas Gerald (1079).
2046 III.—NEWTON R. STEEL, for **Algernon Best of All**, born May 18, 1924, calved June 26, 1934, bred by Algernon M. Fleet, Darenth Grange, Dartford; *s.* Hattingley Algernon, *d.* Algernon Coquette *by* Ratmore Rosebud 367.
2043 R.N.—THE KERRY COW DAIRY FARMS, Layer-de-la-Haye, Colchester, for **Minley Winnie 2nd.**

Class 218.—*Kerry Heifers, in-milk, born in* 1931 *or* 1932.

2053 I.—BERTRAM W. A. WATNEY, Brookwood Corner, Holmwood, Surrey, for **Brookwood Claire 5358**, born June 8, 1931, calved April 25, 1934; *s.* Chaldon Hornet 758, *d.* Dearie of Warren 3835 *by* Wadlands Castle Lough Lord 536.
2051 II.—H. E. MITCHELL, Great Pellingbridge Farm, Scaynes Hill, Haywards Heath, for **Barrington Tulip 2nd 5352**, born July 20, 1931, calved June 11, 1934; *s.* O.P.H. Loch Lord 847, *d.* Gort Tulip 3rd 4941 *by* Pallas Ladus (1583).
2050 III.—MISS HONOR BOWEN-COLTHURST, Vernons, Wakes Colne, Colchester, for **Summerhill Utility 5589**, born April 12, 1931, calved April 28, 1934, bred by Samuel Gibson, Summerhill, Dunmurry, Antrim; *s.* Ard Caein Metellus (1662), *d.* Summerhill Minx (4983) *by* Summerhill Prince (1084).
2052 R.N.—NEWTON R. STEEL, The Hookland Estate, Scaynes Hill, Haywards Heath, for **Hookland Bonne.**

Dexters.

N.B.—In the Dexter Classes, the number inserted within brackets after the name of an animal indicates the number of such animal in the Royal Dublin Society's Herd Book. A number without brackets indicates that the animal is registered in the English Dexter Herd Book.

Class 219.—*Dexter Bulls, born in or before* 1932.

2058 I. & Champion.[2]—MRS. HOWARD PALMER, Heathlands, Wokingham, for **Grinstead Water Nigger**, born Sept. 11, 1932, bred by Lady Loder, Leonardslee, Horsham; *s.* Ratcliffe Negro's Manager 1096, *d.* Grinstead Watercress 4th 4311 *by* Pulham Smile 1054.
2055 II.—MRS. ERNEST JOHNSON, Ashton Hayes, Chester, for **Grinstead Taxi 1089**, born Aug. 6, 1929, bred by Lady Loder, Leonardslee, Horsham; *s.* Oakridge Evergood 2nd 1014, *d.* Grinstead Taxus 2nd 3630 *by* Cobham Clinker 826.
2056 III.—MRS. RICHARD MAGOR, Springfield Lyons, Chelmsford, for **Lyons Red Berry 1117**, born April 26, 1931; *s.* Grinstead Cran Berry 1041, *d.* Lyons Red Lady 3883 *by* Bertie of Grinstead 765.
2057 R.N.—THE REV. E. A. DOUGLAS MORGAN, Trefonen Rectory, Oswestry, for **Grinstead Clever.**

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[1] Silver Challenge Cup given by the British Kerry Cattle Society for the best Kerry.
[2] Silver Challenge Cup given by the Dexter Cattle Society for the best Dexter.

Class 220.—*Dexter Bulls, born in* 1933.

2061 I. & R.N. for Champion.[1]—LADY LODER, Leonardslee, Horsham, for **Grinstead Plutocrat**, born Jan. 27; *s.* Ratcliffe Negro's Manager 1096, *d.* Brokenhurst Penelope 3rd 3075 *by* Brokenhurst Morilla 651.

2063 II.—MRS. H. P. MAY, The Priory, Tiptree, Essex, for **Braxted Premier 2nd**, born Sept. 24; *s.* Ratcliffe Pippin 1098, *d.* Byford Primrose 2728 F.S.

2064 III.—MRS. H. P. MAY, for **Braxted Sovereign**, born Sept. 15; *s.* Ratcliffe Pippin 1098, *d.* Braxted Gold Flake *by* Bagendon Emblem 869.

2062 R.N.—MRS. RICHARD MAGOR, Springfield Lyons, Chelmsford, for **Lyons Rambling Lord.**

H.C.—2066, 2067.

Class 221.—*Dexter Cows, in-milk, any age.*

2069 I.—ROY N. CORNER, The Wellington Pedigree Farm, Hereford, for **Ratcliffe Blackbird** 3860, born Nov. 24, 1926, calved March 21, 1934, bred by W. Lindsay Everard, M.P., Ratcliffe Hall, Leicester; *s.* Fillongley Forester 630, *d.* Bryn Nigger 2395 *by* Oakridge Marston Daddy 511.

2077 II.—MRS. HOWARD PALMER, Heathlands, Wokingham, for **Grinstead Convolvulus 4th** 4305, born March 31, 1930, calved May 5, 1934, bred by Lady Loder, Leonardslee, Horsham; *s.* Oakridge Evergood 2nd 1014, *d.* Grinstead Convolvulus 3458 *by* Brokenhurst Penny 2nd 694.

2072 III.—LADY LODER, Leonardslee, Horsham, for **Grinstead Nightingale 3rd** 3626, born Dec. 19, 1925, calved May 18, 1934; *s.* Brokenhurst Penny 2nd 694, *d.* Grinstead Nightingale 3310 *by* Cobham Caruso 729.

2071 IV.—MISS N. M. LLOYD, Pentre Hobyn, Mold, for **Pentre Hobyn Jasmine** 4145, born April 22, 1927, calved May 24, 1934; *s.* Grinstead Watersprite 928, *d.* Brokenhurst Jonquil 3240 *by* Brokenhurst Philip 726.

2075 R.N.—MRS. H. P. MAY, The Priory, Tiptree, Essex, for **Braxted Red Peach.**

H.C.—2073.

Class 222.—*Dexter Heifers, in-milk to first calving, born in* 1931 *or* 1932.

2079 I.—MRS. ERNEST JOHNSON, Ashton Hayes, Chester, for **Ashtonhayes Creina**, born May 20, 1932, calved June 6, 1934; *s.* Grinstead Taxi 1089, *d.* Grinstead Convolvulus 3458 *by* Brokenhurst Penny 2nd 694.

2080 II.—MRS. T. H. PEYTON, Colomendy, Mold, for **Colomendy Sibell**, born in 1932, calved May 7, 1934, bred by H. Cameron, Longpopel, Glos.; *s.* Oasborne Argulus 1142, *d.* Meon Dainty Dulcibel *by* Meon Dainty Bollinger 1050.

Milk Yield Classes.

Class 223.—*Dairy Shorthorn Cows or Heifers.*

1220 I.—G. H. WILLIS, for **Knells Golden Duchess 2nd.** (See Class 152.)

1200 II.—A. THOMAS LOYD, Lockinge House, Wantage, for 109964 **Lockinge Dulce 2nd**, red, born Oct. 12, 1928, calved April 9, 1934; *s.* Lockinge Bandit 20th 217412, *d.* 74926 Kelmscott Dulce 51st *by* Playford Peter 192862.

1184 III.—E. UWINS GILLATE, Shawlands, Lingfield, for 76322 **Orfold Lydia 5th**, dark red roan, born July 13, 1925, calved June 6, 1934, bred by A. Luckin, Orfold, Wisborough Green, Sussex; *s.* Orfold Linksman 2nd 150892, *d.* Astley Lydia *by* Guardian 102423.

1188 IV.—J. PIERPONT MORGAN, Wall Hall, Aldenham, Watford, for 100022 **Aldenham Kirklevington Lady 3rd**, red, born June 15, 1927, calved Feb. 11, 1934; *s.* Aldenham Kirklevington Duke 2nd 204357, *d.* 77344 Aldenham Kirklevington Lady *by* Cotlands Waterloo Duke 6th 155058.

1197 R.N.—FREDERICK CHAPMAN, for **Flower 3rd.** (See Class 151.)

H.C.—1194.

Class 224.—*Lincolnshire Red Shorthorn Cows or Heifers.*

1292 I.—CHIVERS & SONS, LTD., for **Histon Acacia 5th.** (See Class 160.)

1287 II.—FRANK SAINSBURY, Blunts Hall, Little Wratting, Haverhill, for **Bendish Poppy 9th** (Vol. 32, p. 500), born Feb. 28, 1925, calved May 17, 1934, bred by Russell Wood, Bendish House, Hitchin; *s.* Langford Bendish 19564, *d.* Bendish Poppy 5th *by* King of the Burtons 10020.

1290 III.—RUSSELL WOOD, for **Bendish Nancy 18th.** (See Class 159.)

1291 R.N.—RUSSELL WOOD, for **Bendish Pansy 19th.**

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[1] Silver Challenge Cup given by the Dexter Cattle Society for the best Dexter.

Class 225.—*South Devon Cows or Heifers.*

1323 I.—Dartington Hall, Ltd., Old Parsonage Farm, Totnes, for **Dartington Hilda** 36140, born Nov. 28, 1927, calved June 14, 1934, bred by R. G. Hall, Ferry House, Bere Alston; *s.* Forager 10236, *d.* Pinky 2nd 21454 *by* Barton Pines Ketchup 6940.

1324 II.—Dartington Hall, Ltd., for **Pat** 26770, born July 3, 1922, calved June 8, 1934, bred by F. G. Furneaux, Hele Farm, Ashburton; *s.* Ranger 9414, *d.* Berry Pansy 19751 *by* Guy Fawkes 4398.

1329 III.—Miss Jervoise Smith, Sandwell, Harberton, Totnes, for **Dittisham Nina 2nd** 31766, born June 9, 1925, calved May 24, 1934, bred by Capt. Starkey, Dittisham Court, Devon; *s.* Iwerne Dairy Prince 4th 10737, *d.* Dittisham Nina 29246 *bu* Widland Forester 2nd 8871.

Class 226.—*Red Poll Cows or Heifers.*

1428 I.—Stuart Paul, Kirton Lodge, Ipswich, for 32945 **Model Victoria**, born Oct. 6, 1923, calved March 26, 1934, bred by H. D. Longe, Abbots Hall, Stowmarket; *s.* Combs Heroic 11912, *d.* 26963 Henham Victoria *by* Manor Ash 11033.

1437 II.—Lt.-Col. Sir Merrik R. Burrell, Bart., C.B.E., Knepp Castle Estate Office, Horsham, for 43640 **Knepp Cowslip 14th**, born Feb. 5, 1929, calved June 11, 1934; *s.* Knepp Insurance 13832, *d.* 36024 Knepp Cowslip 8th *by* Knepp Meadow Marquis 13097.

1430 III.—Capt. Alan Richardson, Seven Springs Farm, Cheltenham, for 38334 **Seven Springs Quartz**, born Jan. 26, 1926, calved May 24, 1934; *s.* Knepp Ajax 11397, *d.* 30380 Seven Springs Quest *by* Harefield Clinker 11000.

1414 IV.—Lord Cranworth, for **Grundisburgh Wanderer.** (See Class 172.)

1415 V.—F. H. Crittall, Lanham Manor Farm, Cressing, Braintree, for 38137 **Northwick Vim 3rd**, born May 9, 1926, calved March 28, 1934, bred by Capt. E. G. Spencer Churchill, Northwick Park, Blockley; *s.* Hallingbury Duke 13040, *d.* 31530 Northwick Vim *by* Ashmoor Joseph 11254.

1410 R.N.—His Majesty The King, for **Necton Daffodil.** (See Class 172.)
H.C.—1416, 1422, 1429, 1438, 1441, 1443.

Class 227.—*Blue Albion Cows or Heifers.*

1550 I.—C. H. Webster, for **Ivonbrook Betty.** (See Class 180.)
1549 II.—W. E. Glover, for **Mount Crocus 3rd.** (See Class 180.)

Class 228.—*British Friesian Cows or Heifers.*

1628 I.—Bertram Parkinson, Creskeld Hall, Arthington, Leeds, for **Creskeld Piper 3rd** 114750, born March 24, 1927, calved May 13, 1934; *s.* Creskeld Pel Knol 25343 P.I. *d.* Teston Piper 3rd 66776 *by* Clockhouse Rinlod 7513 P.I.

1622 II.—Thos. G. Fairhead, Little Chesterford, Saffron Walden, for **Covenbrook Lively 2nd** 103154, born Feb. 4, 1926, calved June 7, 1934, bred by Edwin Fairhead, White Natley, Witham; *s.* Covenbrook Janus 4th 22417, *d.* Covenbrook Anna 2nd 60276 *by* Melford Bill 10231.

1638 III.—Cecil Ball, Market Place, Oakham, for **Oakham Dairymaid** 139970, born March 17, 1929, calved June 5, 1934; *s.* Topton Count 27231, *d.* Masham Series Dainty 84866 *by* Hedges Second Series 6427 P.I.

1634 IV.—Lord Rayleigh, for **Terling Dazzle 15th.** (See Class 189.)

1620 V.—E. G. Barton, Saundby, Retford, for **Combermere Eleanor 2nd** 125220, born Nov. 6, 1928, calved June 9, 1934; *s.* Hache Capable 28693, *d.* Combermere Eleanor 91476 *by* Northdean Bram Bertus 14981.

1645 R.N.—Lord Rayleigh, for **Terling Breeze 36th.**
H.C.—1621, 1632, 1633.

Class 229.—*Ayrshire Cows or Heifers.*

1724 I.—Mrs. J. Greenshields, Ivy House Farm, East Herrington, Sunderland, for **Catlins Bluebell** 21094, born Nov. 20, 1927, calved June 10, 1934, bred by M. Cochrane, Catlins, Lockerbie; *s.* Morton Mains White Knight 22538, *d.* Ryemuir Mist 2nd 76946 *by* Netherhall Reserve 17503.

1739 II.—Lord Rayleigh, The Bury, Hatfield Peverel, Chelmsford, for **Balgreddan Jess 2nd** 24167, born Feb. 20, 1929, calved May 11, 1934, bred by James Wallace, Balgreddan, Kirkcudbright; *s.* Low Milton Campaigner 24834, *d.* Chapelhill Jess 2nd 415 *by* Auchenbrain Royal Blood 17544.

1721 III.—Capt. W. B. Dronsfield, The Manor House, Wilmcote, Stratford-on-Avon, for **Leaths Annabella** 5157, born Feb. 13, 1925, calved June 19, 1934, bred by Matthew Smith, Leaths, Castle Douglas; *s.* Holehouse Fascinator, *d.* Leaths Carmen 4th 77968 *by* Leaths Spion Kop 20951.

1722 R.N.—Eshott Pedigree Stock Farms, for **Eshott Princess.** (See Class 198a.)
H.C.—1744.

Class 230.—*Guernsey Cows or Heifers.*

1818 I.—H. A. Y. Dyson, Daltons, Haywards Heath, for 32560 **Primrose of Pothill** fawn and white, born May 16, 1929, calved April 1, 1934, bred by H. J. Dunaway, Southwater, Horsham; *s.* Poltimore Trojan 2nd 6479, *d.* 21852 Rockbeare Primula *by* Ladock Prince Rupert 4245.

1820 II.—Esmond D. Fairweather, The Grange Home Farm, Northington, Alresford, for 20029 **May Boy Daisy of the Blanche,** fawn and white, born June 6, 1924, calved June 19, 1934, bred by Mrs. G. Rose, Les Blanches, St. Martins, Guernsey; *s.* Valentine of Vimiera 5707 P.S., *d.* 17686 P.S. May Boy Daisy of Catel Farm *by* May Boy of Mont Plaisant.

1821 III.—Esmond D. Fairweather, for 40601 **Rex's Primrose of Maison de Bas,** fawn and white, born Sept. 22, 1927, calved May 3, 1934, bred by G. Le Page, Maison de Bas, St. Andrews, Guernsey; *s.* Rex of Havilland Hall 5105 P.S., *d.* 23747 P.S. Primrose of Camp Joinet *by* Cyrene's Lad of the Rouvets 4252 P.S.

1835 IV.—Capt. Cosmo Douglas, Hazelby, Newbury, for 34340 **Meadow Sweet 5th of Chute Standen,** fawn and white, born Sept. 30, 1930, calved March 30, 1934, bred by Capt. Conyers Lang, Chute Standen, Andover; *s.* Nutbane Hero 7228, *d.* 27315 Meadow Sweet of Chute Standen *by* Clatford Maitre du Moulin 5466.

1834 V.—Capt. Cosmo Douglas, for **Hazelby Honoria.** (See Class 205.)

1816 R.N.—Capt. Cosmo Douglas, for **Hazelby Sunshine.** (See Class 204.)
H.C.—1817, 1819, 1824, 1829, 1831.

Class 231.—*Jersey Cows or Heifers.*

1964 I.—H. S. Mountain, Groombridge Place, Kent, for 14509 **Sir Laurence's Imogen,** whole colour, born Feb. 19, 1929, calved May 25, 1934; *s.* Sir Laurence 16187, *d.* 1509 Blonde Imogen *by* Blonde's Golden Oxford 12554.

1976 II.—Lady Walston, Newton Hall, Newton, Cambridge, for 17322 **Newton Queen 4th,** fawn, born April 16, 1930, calved April 19, 1934; *s.* Majestic Prince 16907, *d.* 8303 Newton Promise *by* Marquis 14884.

1960 III.—Gordon McWilliam, Dunwood Manor Farm, Romsey, Hants., for 12170 **Bollhayes May's Sunrise,** whole fawn, born Nov. 15, 1928, calved Feb. 13, 1934; *s.* Warrior's Cid You'll Do 15462, *d.* 6004 Bollhayes Princess May *by* Lustre's Sultan 15059.

1956 IV.—S. S. Lockwood, Normanby Hall, Sinnington, Yorks., for 10666 **Cowslip 5th,** whole colour brown, born Dec. 22, 1927, calved April 30, 1934, bred by A. W. Ruggles Brise, Spains Hall, Braintree; *s.* Lingen Sweep Time 15523, *d.* Cowslip *by* Minorca's Jolly Sultan 12076.

1950 V.—Capt. E. L. Hughes, R.N., Spring Hill, Capel, Ipswich, for 17548 **Princess Peggy,** whole colour, born Oct. 24, 1928, calved May 27, 1934; *s.* Kentwins Yellow Prince 16310, *d.* Peggy 5th *by* Goddington Noble 16th 12819.

1938 R.N.—Grosvenor Berry, Mount Bures, Bures, Essex, for **Rosie.**
H.C.—1940, 1941, 1942, 1946, 1952, 1967, 1968, 1969, 1972, 1973, 1996.

Class 232.—*Kerry Cows or Heifers.*

2047 I. & Champion.[1]—Newton R. Steel, for **Gort Tulip.** (See Class 217.)

2044 II. & R.N. for Champion.[1]—H. E. Mitchell, Great Pellingbridge Farm, Scaynes Hill, Haywards Heath, for **Cuckfield Pearl** 4082, born May 20, 1925, calved May 22, 1934, bred by J. E. Johnston, Cuckfield, Sussex; *s.* Ard Caein Nowal 628, *d.* Buckhurst Pearl 1875 *by* Lackham Puzzler 255.

2048 III.—The Kerry Cow Dairy Farms, Layer-de-la-Haye, Colchester, for **Minley Winnie 2nd** 3949, born Aug. 29, 1922, calved June 12, 1934, bred by Laurence Currie, Minley Manor, Farnborough; *s.* Sloe Drop 415, *d.* Minley Winnie 2450 *by* Valencia Lord 3rd 370.

Class 233.—*Dexter Cows or Heifers.*

2072 I. & Champion.[2]—Lady Loder, for **Grinstead Nightingale 3rd.** (See Class 221.)

2077 II. & R.N. for Champion[2].—Mrs. Howard Palmer, for **Grinstead Convolvulus 4th.** (See Class 221.)

2071 III.—Miss N. M. Lloyd, for **Pentre Hobyn Jasmine.** (See Class 221.)

2073 R.N.—Lady Loder, for **Grinstead Tropaeolum 2nd.**
H.C.—2069, 2070.

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[1] The "Elmhurst" Perpetual Silver Challenge Cup given by the British Kerry Cattle Society for the Kerry Cow gaining the highest number of points.
[2] Perpetual Silver Challenge Cup given by the Dexter Cattle Society for the Dexter Cow gaining the highest number of points.

Butter Tests.

Class 234.—*Cows of the Guernsey, Jersey, Kerry and Dexter Breeds.*

1976 I., Champion[1] & G.M.[2]—LADY WALSTON, for Newton Queen 4th. (See Class 231.)
1950 II. & S.M.[2]—CAPT. E. L. HUGHES, R.N., for Princess Peggy. (See Class 231.)
1964 III. & B.M.[2]—H. S. MOUNTAIN, for Sir Laurence's Imogen. (See Class 231.)
1963 IV.—H. S. MOUNTAIN, for 8554 Sir Laurel's Berthe, broken colour, born July 26, 1926, calved Feb. 13, 1934; *s.* Sir Laurel 15228, *d.* 2795 Xenia's Berthe *by* Xenia's Sultan.
1956 V.—S. S. LOCKWOOD, for Cowslip 5th. (See Class 231.)
1940 R.N. & C.M.[3]—MRS. C. J. CADDEY, Manor House, Egham, for Snow Cloud.
H.C. & C.M.[3]—1816, 1818, 1819, 1820, 1831, 1835.
H.C. & C.M.[4]—1938, 1941, 1942, 1960, 1967, 1968, 1969, 1972.
H.C.—1824, 1829.

Class 235.—*Cows of any other Breed.*

1634 I. & R.N. for Champion.[1]—LORD RAYLEIGH, for Terling Dazzle 15th. (See Class 189.)
1290 II.—RUSSELL WOOD, for Bendish Nancy 18th. (See Class 159.)
1287 III.—FRANK SAINSBURY, for Bendish Poppy 9th. (See Class 224.)
1628 IV.—BERTRAM PARKINSON, for Creskeld Piper 3rd. (See Class 228.)
1645 V.—LORD RAYLEIGH, for Terling Breeze 36th, 141926 born Sept. 30, 1929, calved June 11, 1934; *s.* Dunninald Haeayemairschaap 7699 P.I., *d* Terling Breeze 17th 76730 *by* Terling (imp. 1922) Marthus 21533.
1323 R.N.—DARTINGTON HALL, LTD., for Dartington Hilda. (See Class 225.)
H.C.—1184, 1197, 1324, 1329, 1422, 1430, 1620, 1739.

GOATS.[5]

The Prizes in each Class for Goats are: First Prize, £5; Second Prize, £3; Third Prize, £2; Fourth Prize, £1; Fifth Prize, 10s.

Class 236.—*Toggenburg Female Goats, in-milk, any age.*

2081 I. & Champion.[6]—MISS ALEXANDER, Byards Lodge, Knaresborough, for Stockwell Calsie 732, born Jan. 1, 1932, kidded March 18, 1934; *s.* Murrayston Hal 675, *d.* Stockwell Corella 658 *by* Sandhill Monday 553.
2082 II. & R.N. for Champion.[6]—MISS E. M. SHEPPARD, Weft House, Widdington, Newport, Essex, for Widdington Willenda 741, born June 19, 1932, kidded April 6, 1934; *s.* Nydo of Weald 673, *d.* Broxbourne Sunset 628 *by* Sandhill Monday 553.

Class 237.—*Saanen Female Goats, in-milk, any age.*

[No Award.]

Class 238.—*British Saanen Female Goats, in-milk, any age.*

2101 I. & Champion.[7]—MISS V. WALTON, Hawthorn Cottage, East Ashling, Chichester, for Dissington Marcella 308, born April 24, 1931, kidded April 14, 1934, bred by Mrs. Rutherford, Ravensworth, Gateshead-on-Tyne; *s.* Ridgeway Runli 255, *d.* Dissington Marvella 9274.
2095 II. & R.N. for Champion.[7]—MRS. MORCOM, Clock House, Bromsgrove, for Cornish Renown 270, born Feb. 2, 1929, kidded April 2, 1933; *s.* Ridgeway Rumpelstiltskin 6536, *d.* Leazes Fortitude 3710 *by* Leazes Haydon.
2087 III.—MRS. B. A. BROWELL, Ringletts Farm, Battle, Sussex, for Rydale Silver 344, born Feb. 13, 1931, kidded March 1, 1934, bred by W. A. Beecroft, Church Street, Helmsley, Yorks.; *s.* Didgemere Sam 114, *d.* Ryedale Daisy 9058 *by* Gulden 37.

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[1] Champion Gold Medal given for the Cow obtaining the highest number of points.
[2] Gold Medal (or £10 in money), Silver Medal and Bronze Medal given by the English Jersey Cattle Society for the three Jersey Cows obtaining the greatest number of points in the Butter Tests.
[3] Certificates of Merit given by the English Guernsey Cattle Society for Guernsey Cows, not being Prize Winners, obtaining the following points: Cows, four years old and under, 36; Cows over four years old, 41.
[4] Certificates of Merit given by the English Jersey Cattle Society for Jersey Cows, not being Prize Winners, obtaining the following points: Cows four years old and under, 36; Cows over four years old, 41.
[5] £40 towards these prizes was given by the British Goat Society, and all the Challenge Certificates, Medals and Cups enumerated below, and on pages lxxxv to lxxxvii, were given through the British Goat Society.
[6] Breed Challenge Certificate for the best Toggenburg Female Goat, over 2 years old.
[7] Breed Challenge Certificate for the best British Saanen Female Goat, over 2 years old.

2094 IV.—Miss M. G. M. Madoc, Saham Toney, Thetford, for **Melverley Melican 369**, born Feb. 15, 1931, kidded Jan. 12, 1934; *s.* Theydon Pelican 166, *d.* Melverley Mystery 8201 *by* Didgemere Dennis 5487.
2088 R.N.—J. R. Egerton, Malpas Cottage, Rushmere, Ipswich, for **Malpas Melody.**
H.C.—2093. C.—2100.

Class 239.—*British Alpine Female Goats, in-milk, any age.*

2107 I. & Champion.[1]—Mrs. W. A. Stirling, Nussteads, Polstead, Suffolk, for **Didgemere Petunia 10214**, born April 13, 1931, kidded May 18, 1933, bred by Mrs. A. Abbey, Downe Hall, Roydon; *s.* Didgemere Dago 8840, *d.* Didgemere Dingus 8828 *by* Pan of Bashley 8055.
2105 II. & R.N. for Champion.[1]—Miss Pope, Bashley Lodge, New Milton, Hants., for **Cornish Fealty 148**, born Jan. 30, 1931, kidded March 18, 1934, bred by Mrs. Morcom, Clock House, Bromsgrove; *s.* Pleaser of Bashley 9571, *d.* Cornish Faith 9392 *by* Priest of Bashley 6926.
2106 III.—Mrs. W. A. Stirling, for **Didgemere Diriam 160**, born Feb. 10, 1931, kidded March 15, 1934, bred by Mrs. A. Abbey, Downe Hall, Roydon; *s.* Warrior of Westons 90, *d.* Hareapple Skylark 121 *by* Parkfield Pygmalion 7697.
2108 R.N.—Miss C. Chamberlain, Westons, Lyndhurst, for **Whin of Westons.**
H.C.—2108

Class 240.—*Anglo-Nubian Female Goats, in-milk, any age.*

2113 I. & Champion.[2]—J. R. Egerton, Malpas Cottage, Rushmere, Ipswich, for **Malpas Merilees 2147**, born Feb. 16, 1932, kidded Feb. 4, 1934; *s.* Hoveton Freckle 1873, *d.* Malpas Magnolia 18 *by* Hoveton Friar 1874.
2114 II. & R.N. for Champion.[2]—Mrs. M. E. T. Howden, Horstead, Coltishall, Norfolk, for **Theydon Adelaide 1996**, born March 27, 1929, kidded May 11, 1934, bred by Miss K. Pelly, Theydon Place, Epping; *s.* Theydon Blarney 1903, *d.* Theydon Almeda 1766 *by* Theydon Banjo.
2116 III.—Miss K. Pelly, Theydon Place, Epping, Essex, for **Theydon Belle 2019**, born March 15, 1930, kidded March 25, 1934; *s.* Theydon Bertrano 1725, *d.* Theydon Bella 1909 *by* Ramhurst Corker 1799.
2112 R.N.—J. R. Egerton, for **Hoveton Frailty.**

Class 241.—*British Toggenburg or British Female Goats, in-milk, any age.*

2120 I., Champion[3] & Champion.[4]—Mrs. R. St. V. Bagnall, The Willows, Little Fransham, Dereham, for **Fransham Forsythia 10010**, British, born Feb. 4, 1931, kidded March 1, 1934; *s.* Didgemere Dragonfly 165, *d.* Didgemere Dong 5960 *by* Didgemere Duncan 5556.
2121 II., R.N. for Champion[3] & R.N. for Champion.[4]—Mrs. B. A. Browell, Ringletts Farm, Battle, Sussex, for **Feltham Frisky 10143**, British, born March 5, 1931, kidded March 27, 1934; *s.* Playwright of Bashley 8035, *d.* Play of Bashley 6540 *by* Herne Bay Thark.
2130 III.—Mrs. Morcom, Clock House, Bromsgrove, for **Cornish Refrain 10307**, British, born Jan. 22, 1931, kidded March 10, 1934; *s.* Cornish Regard 9427, *d.* Cornish Catch 8418 *by* Raydon Benedict 6646.
2132 IV. & Champion.[5]—Mrs. Morcom, for **Cornish Saint 10600**, British Toggenburg, born March 17, 1932, kidded June 8, 1934; *s.* Fryston Sansovino 576, *d.* Cornish Puritan 8936 *by* Priest of Bashley 6026.
2122.—Miss C. Chamberlain, Westons Lyndhurst, for **Wavelet of Westons.**
H.C.—2128. C.—2124.

Class 242.—*Saanen or British Saanen Goatlings, over 1 but not exceeding 2 years old.*

2134 I.—Mrs. R. St. V. Bagnall, The Willows, Little Fransham, Dereham, for **Fransham Frieda 354**, British Saanen, born March 10, 1933; *s.* Didgemere Aristocrat 105, *d.* Malpas Mona 306 *by* Springfield Luke 121.
2135 II.—Miss C. Chamberlain, Westons, Lyndhurst, for **Wise of Westons 10973**, British Saanen, born March 23, 1933; *s.* Springfield Count 8514, *d.* Didgemere Boadicea 284 *by* Warrior of Westons 9011.
2137 III.—Miss. V. Walton, Hawthorn Cottage, East Ashling, Chichester, for **April Moonstone 877**, British Saanen, born April 30, 1933; *s.* Springfield Luke 121, *d.* Dissington Marcella 808.

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[1] Breed Challenge Certificate for the best British Alpine Female Goat, over 2 years old.
[2] Challenge Certificate for the best Anglo-Nubian Female Goat over 2 years old.
[3] Challenge Certificate for the best Female Goat over 2 years old that has borne a kid.
[4] Bronze Medal for the best Female Goat.
[5] Breed Challenge Certificate for the best British Toggenburg Female Goat, over 2 years old.

Class 243.—*British Alpine Goatlings, over* 1 *but not exceeding* 2 *years old.*

2141 I. & Champion.[1]—MISS M. G. M. MADOC, Saham Toney, Thetford, for **Melverley Merrilees** 10886, born Feb. 21, 1933; *s.* Wansbeck of Westons 146, *d.* Dissington Mabel 10220 *by* Ridgeway Rünli 8711.

2143 II.—MISS POPE, Bashley Lodge, New Milton, Hants., for **Preface of Bashley** 10959, born Feb. 24, 1933; *s.* Didgemere Daredevil 10657, *d.* Whiteface of Westons 9735 *by* Springfield Count 8514.

2145 III.—MRS. W. A. STIRLING, Nussteads, Polstead, Suffolk, for **Bitterne Domino** 10935, born March 17, 1933, bred by Miss K. Barnaby, Abbeymead, Hamble, Hants.; *s.* Didgemere Dragonfly 165, *d.* Homestall Domino 6730 *by* Homestall Dunkeld 4767.

2139 R.N.—MRS. R. ST. V. BAGNALL, The Willows, Little Fransham, Dereham, for **Fransham Florinda.**

H.C.—2147. C.—2146.

Class 244.—*Anglo-Nubian Goatlings, over* 1 *but not exceeding* 2 *years old.*

2153 I.—MRS. M. E. T. HOWDEN, Horstead, Coltishall, Norwich, for **Bogbean** 2250, born March 6, 1933, bred by Miss Athill, Ditchingham Hall, Norfolk; *s.* Bonnyboy of Coltishall 2131, *d.* Tamar Almond 2107 *by* Layland Paddy.

2150 II.—J. R. EGERTON, Malpas Cottage, Rushmere, Ipswich, for **Malpas Molly** 2246, born May 6, 1933; *s.* Garrochty Gaiters 2181, *d.* Hoveton Frivolity 2074 *by* Hoveton Borage 1930.

2151 III.—J. R. EGERTON, for **Malpas Margarita** 2226, born Jan. 22, 1933; *s.* Garrochty Gaiters 2181, *d.* Hoveton Frailty 2073 *by* Hoveton Borage 1930.

2155 R.N.—MISS K. PELLY, Theydon Place, Epping, Essex, for **Theydon Judy.**

Class 245.—*Toggenburg, British Toggenburg or British Goatlings, over* 1 *but not exceeding* 2 *years old.*

2156 I. & R.N. for Champion.[1]—MRS. R. ST. V. BAGNALL, The Willows, Little Fransham, Dereham, for **Fransham Fairy** 10876, British, born March 8, 1933; *s.* Wansbeck of Westons 146, *d.* Didgemere Demma 9624 *by* Didgemere Dago 66.

2157 II.—J. R. EGERTON, Malpas Cottage, Rushmere, Ipswich, for **Didgemere Delterel** 11239, British, born Feb. 22, 1933; *s.* Didgemere Monarch 10656, *d.* Didgemere Delta 8830 *by* Didgemere Doctor 8436.

2159 III.—MRS. MORCOM, Clock House, Bromsgrove, for **Cornish Praline** 11123, British Toggenburg, born Feb. 27, 1933; *s.* Pleaser of Bashley 9571, *d.* Cornish Saccharine 10802 *by* Fryston Sansovino 567.

2160 R.N.—MISS V. WALTON, Hawthorn Cottage, East Ashling, Chichester, for **April Primula.**

Class 246.—*Toggenburg, British Toggenburg, Saanen, British Saanen, or British Alpine Female Kids, not over* 1 *year old.*

2171 I.—MRS. W. A. STIRLING, Nussteads, Polstead, Suffolk, for **Twinstead Tilly** 11431 British Alpine, born Dec. 29, 1933; *s.* Didgemere Barrister 204, *d.* Stockwell Belinda 10325 *by* Stockwell Tzar 9647.

2168 II.—MISS M. G. M. MADOC, Saham Toney, Thetford, for **Melverley Mistaken** 11388, British Alpine, born March 7, 1934; *s.* Twinstead Thark 221, *d.* Melverley Match 10888 *by* Wansbeck of Westons 146.

2167 III.—MISS M. G. M. MADOC, for **Melverley Metatone** 11384, British Saanen, born Jan. 12, 1934; *s.* Wansbeck of Westons 146, *d.* Melverley Melican 369 *by* Theydon Pelican 166.

2164 IV.—MISS C. CHAMBERLAIN, Westons, Lyndhurst, for **Way of Westons** 11354, British Saanen, born March 4, 1934; *s.* Heddon Shoemaker 11155, *d.* Didgemere Boadicea 284 *by* Warrior of Westons 9011.

2169 R.N.—MRS. MORCOM, Clock House, Bromsgrove, for **Cornish Ukelele.**

H.C.—2163. C.—2165.

Class 247.—*Anglo-Nubian or British Female Kids, not over* 1 *year old.*

2182 I.—MISS M. G. M. MADOC, Saham Toney, Thetford, for **Melverley Myvita** 11383, British, born Jan. 12, 1934; *s.* Wansbeck of Westons 146, *d.* Melverley Melican 369 *by* Theydon Pelican 166.

2184 II.—MISS POPE, Bashley Lodge, New Milton, Hants., for **Previous of Bashley** 11349, British, born Feb. 8, 1934; *s.* Didgemere Daredevil 10657, *d.* Whiteface of Westons 9735 *by* Springfield Count 8514.

2175 III—MRS. R. ST. V. BAGNALL, The Willows, Little Fransham, Dereham, for **Fransham Fern** 11425, British, born March 1, 1934; *s.* Didgemere Monarch 211, *d.* Fransham Forsythia 10010 *by* Didgemere Dragonfly 165.

2185 IV.—MRS. W. A. STIRLING, for **Twinstead Tishy** 11432, British, born December 29, 1933; *s.* Didgemere Barrister 204, *d.* Stockwell Belinda 10325 *by* Stockwell Tzar 9647.

2176 R.N.—MRS. B. A. BROWELL, Ringletts Farm, Battle, Sussex, for **Feltham Flashlight.**

H.C.—2178. C.—2179.

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[1] Bronze Medal for the best Goatling.

Milk Yield Classes.

Class 248.—*Milk Yield Class, Quality, open to animals entered in Classes 236 to 241.*

2121 I. & Champion.[1]—Mrs. B. A. Browell, for Feltham Frisky. (See Class 241.)
2120 II. & R.N. for Champion.[1]—Mrs. R. St. V. Bagnall, for Fransham Forsythia. (See Class 241.)
2103 III. & Champion.[2]—Miss. C. Chamberlain, Westons, Lyndhurst, for Whin of Westons 163, born May 8, 1930, kidded May 15, 1934; *s.* Didgemere Angus 7161, *d.* Champion Whimsical of Westons 7051 *by* Didgemere Dictator 6816.
2131 IV.—Mrs. Morcom, Clock House, Bromsgrove, for Cornish Saccharine 10302, born Feb. 22, 1931, kidded April 13, 1934; *s.* Fryston Sansovino 567, *d.* Cornish Fondant 8882 *by* Cornish Quirk 6979.
2124 V. & (with 2150) Champion.[3]—J. R. Egerton, Malpas Cottage, Rushmere, Ipswich, for Malpas Magna 10285, born April 17, 1931, kidded April 14, 1933; *s.* Springfield Lake 121, *d.* Worlington Wavey 133 *by* Springfield Fortuity 88.
2095 Champion[4] & (with 2159) R.N. for Champion.[3]—Mrs. Morcom, for Cornish Renown. (See Class 238.)
2108 R.N. for Champion.[2]—Mrs. W. A. Stirling, Nussteads, Polstead, Suffolk, for Twinstead Tegus.
2088 H.C. & R.N. for Champion.[4]—J. R. Egerton, for Malpas Melody.
2113 Champion.[5]—J. R. Egerton, for Malpas Merilees. (See Class 240.)
2116 R.N. for Champion.[5]—Miss K. Pelly, for Theydon Belle. (See Class 240.)
H.C.—2105, 2106, 2125.

Class 249.—*Milk Yield Class, Quantity, open to animals entered in Classes 236 to 241.*

2121 I.—Mrs. B. A. Browell, for Feltham Frisky. (See Class 241.)
2124 II.—J. R. Egerton, for Malpas Magna. (See Class 248.)
2095 III.—Mrs. Morcom, for Cornish Renown. (See Class 238.)
2087 IV.—Mrs. B. A. Browell, for Ryedale Silver. (See Class 238.)
2131 V.—Mrs. Morcom, for Cornish Saccharine. (See Class 248.)
2088 R.N.—J. R. Egerton, for Malpas Melody.
H.C.—2089, 2101, 2103, 2105, 2106, 2107, 2122, 2128, 2130.

SHEEP.

Unless otherwise stated, the Prizes in each Class for Sheep are: First Prize, £10; Second Prize, £5; Third Prize, £3; Fourth Prize, £2; Fifth Prize, £1.

Oxford Downs.

Class 250.—*Oxford Down Shearling Rams.*

2189 I., Champion,[6] & Champion,[7] 2188 II. & 2191 R.N.—H. W. Stilgoe, The Grounds, Adderbury, Banbury.
2194 III.—G. H. Willis, Birdlip, Glos.
H.C.—2190.

Class 251.—*Oxford Down Ram Lambs.*

2198 I.—Hobbs & Davis, Kelmscott, Lechlade, Glos.
2203 II. & 2202 R.N.—W. F. G. Watts & Sons, Elsfield, Oxford.
2200 III.—H. W. Stilgoe, The Grounds, Adderbury, Banbury.
2195 IV.—Lawrence B. Akers, Litchfield Farm, Enstone, Oxford.
H.C.—2196.

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[1] Challenge Certificate for the best Dual Purpose Goat, over 2 years old, that has borne a kid.

[2] The "Abbey" Challenge Cup for the British Alpine Goat gaining the highest number of points in Inspection and Milking. The goat must be bred by exhibitor, entered in the British Alpine section of the Herd Book, and have obtained an award in the Inspection Class.

[3] The "Dewar" Challenge Cup for the exhibitor showing a Female Goat in-milk, and a Goatling, under certain conditions.

[4] The "Chamberlain" Challenge Cup for British Saanen Goat gaining the highest number of points in Inspection and Milking. The goat must be bred by exhibitor, entered in the British Saanen section of the Herd Book, and have obtained an award in the Inspection Class.

[5] The "Pomeroy" Challenge Cup for the Anglo-Nubian Goat, entered in the Anglo-Nubian section of the Society's Herd Book, gaining the highest number of points in the Milking Classes.

[6] The "Fernham" Silver Challenge Cup given through the Oxford Down Sheep Breeders' Association for the best Male exhibit.

[7] The "Northwick" Silver Challenge Cup given through the Oxford Down Sheep Breeders' Association for the best exhibit.

Class 252.—*Three Oxford Down Ram Lambs.*

2210 I. & R.N. for Champion[1], & 2209 II.—W. F. G. Watts & Sons, Elsfield, Oxford.
2207 III.—Hobbs & Davis, Kelmscott, Lechlade, Glos.
2208 R.N.—H. W. Stilgoe, The Grounds, Adderbury, Banbury.
H.C.—2205.

Class 253.—*Three Oxford Down Shearling Ewes.*

2213 I., R.N. for Champion[2] & Champion.[3]—G. H. Willis, Birdlip, Glos.
2212 II.—H. W. Stilgoe, The Grounds, Adderbury, Banbury.

Class 254.—*Three Oxford Down Ewe Lambs.*

2218 I. & R.N. for Champion[3] & 2219 III.—W. F. G. Watts & Sons, Elsfield, Oxford.
2216 II.—Hobbs & Davis, Kelmscott, Lechlade, Glos.
2220 R.N.—G. H. Willis, Birdlip, Glos.
H.C.—2215.

Shropshires.

Class 255.—*Shropshire Shearling Rams.*

2228 I., Champion[4] & Champion,[5] & 2229 III.—E. Craig Tanner, Eyton-on-Severn, Wroxeter, Shropshire.
2221 II., R.N. for Champion[4] & R.N. for Champion.[5]—John M. Belcher, Tibberton Green, Wellington, Shropshire.
2227 R.N.—Major J. N. Ritchie, Tern, Wellington, Shropshire.

Class 256.—*Shropshire Ram Lambs.*[6]

2234 I.—E. Craig Tanner, Eyton-on-Severn, Wroxeter, Shropshire.
2233 II.—Major J. N. Ritchie, Tern Wellington, Shropshire.
2232 III.—A. E. & William Everall, Sherlowe, Wellington, Shropshire.
2230 R.N.—John M. Belcher, Tibberton Green, Wellington, Shropshire.

Class 257.—*Three Shropshire Ram Lambs.*

2238 I.—A. E. & William Everall, Sherlowe, Wellington, Shropshire.
2240 II.—E. Craig Tanner, Eyton-on-Severn, Wroxeter, Shropshire.
2235 III.—John M. Belcher, Tibberton Green, Wellington, Shropshire.
2239 R.N.—Major J. N. Ritchie, Tern, Wellington, Shropshire.

Class 258.—*Shropshire Shearling Ewes.*

2245 I., & 2244 III.—Major J. N. Ritchie, Tern, Wellington, Shropshire.
2243 II.—A. E. & William Everall, Sherlowe, Wellington, Shropshire, for ewe, bred by William Everall, Shrawardine Castle, Shrewsbury.
2242 R.N.—Mrs. Brian Bibby, Hope Farm, Clive, Shrewsbury.

Class 259.—*Three Shropshire Ewe Lambs.*

2249 I.—A. E. & William Everall, Sherlowe, Wellington, Shropshire.
2251 II.—E. Craig Tanner, Eyton-on-Severn, Wroxeter, Shropshire.
2246 III.—John M. Belcher, Tibberton Green, Wellington, Shropshire.
2248 R.N.—J. G. B. Borough, Chetwynd Estate Office, Newport, Shropshire.

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[1] The "Fernham" Silver Challenge Cup given through the Oxford Down Sheep Breeders' Association for the best Male exhibit.

[2] The "Northwick" Silver Challenge Cup given through the Oxford Down Sheep Breeders' Association for the best exhibit.

[3] The "Broadwell" Silver Challenge Plate given through the Oxford Down Sheep Breeders' Association for the best Female exhibit.

[4] The "Hardwicke" Perpetual Silver Challenge Cup, given through the Shropshire Sheep Breeders' Association, for the best exhibit.

[5] Champion Silver Medal given by the Shropshire Sheep Breeders' Association for the best Ram or Ram Lamb in Classes 255 and 256.

[6] Prizes given by the Shropshire Sheep Breeders' Association.

Southdowns.

Class 260.—*Southdown Two Shear Rams.*

2255 I., Champion [1] & R.N. for Champion.[2]—Lady Ludlow, Luton Hoo, Luton, for Luton Hoo 360 of 1932 22128.
2258 II. & R.N. for Champion.[1]—J. Pierpont Morgan, Wall Hall, Aldenham, Watford, for Aldenham 877 of 1932.
2256 III.—J. Pierpont Morgan, for Aldenham 822 of 1932.
2257 R.N.—J. Pierpont Morgan, for Aldenham 839 of 1932.
H.C.—2252, 2254, 2260. C.—2253.

Class 261.—*Southdown Shearling Rams.*

2271 I. & 2270 R.N.—J. Pierpont Morgan, Wall Hall, Aldenham, Watford.
2267 II.—Lady Ludlow, Luton Hoo, Luton.
2265 III.—John Langmead & Sons, Northwood, Ford, Arundel.
2274 IV.—Mrs. V. G. Stride, Head Hone Farm, Lidsey, Bognor Regis.
2263 V.—W. E. H. Hebblethwaite, Upper Swell, Stow-on-the-Wold, Cheltenham.
H.C.—2261, 2266. C.—2262.

Class 262.—*Southdown Ram Lambs.*[3]

2283 I.—John Langmead & Sons, Northwood, Ford, Arundel.
2287 II.—J. Pierpont Morgan, Wall Hall, Aldenham, Watford.
2289 III.—William H. Pitts, Woodhorn, Oving, Chichester.
2292 IV.—Col. Sir S. Wishart, Church Farm, Binsted, Arundel.
2279 V.—The Earl of Derby, K.G., Hatchfield Farm, Newmarket.
2290 R.N.—Mrs. V. G. Stride, Head Hone Farm, Lidsey, Bognor Regis.
H.C.—2284. C.—2277, 2281.

Class 263.—*Three Southdown Shearling Rams.*[3]

2296 I.—Lady Ludlow, Luton Hoo, Luton.
2297 II.—J. Pierpont Morgan, Wall Hall, Aldenham, Watford.
2295 III.—John Langmead & Sons, Northwood, Ford, Arundel.
2298 R.N.—William H. Pitts, Woodhorn, Oving, Chichester.
H.C.—2293, 2299, 2300.

Class 264.—*Three Southdown Ram Lambs.*

2310 I.—William H. Pitts, Woodhorn, Oving, Chichester.
2305 II.—John Langmead & Sons, Northwood, Ford, Arundel.
2304 III.—W. E. H. Hebblethwaite, Upper Swell, Stow-on-the-Wold, Cheltenham.
2309 IV.—J. Pierpont Morgan, Wall Hall, Aldenham, Watford.
2307 V.—Lady Ludlow, Luton Hoo, Luton.
2302 R.N.—The Earl of Derby, K.G., Hatchfield Farm, Newmarket.
H.C.—2301, 2306, 2313.

Class 265.—*Three Southdown Shearling Ewes.*

2316 I., Champion [2] & Champion,[4] & 2318 R.N.—J. Pierpont Morgan, Wall Hall, Aldenham, Watford.
2315 II. & R.N. for Champion.[4]—Lady Ludlow, Luton Hoo, Luton.
2314 III.—John Langmead & Sons, Northwood, Ford, Arundel.
H.C.—2319.

Class 266.—*Three Southdown Ewe Lambs.*

2328 I.—J. Pierpont Morgan, Wall Hall, Aldenham, Watford.
2324 II.—John Langmead & Sons, Northwood, Ford, Arundel.
2323 III.—W. E. H. Hebblethwaite, Upper Swell, Stow-on-the-Wold, Cheltenham.
2321 IV.—The Earl of Derby, K.G., Hatchfield Farm, Newmarket.
2329 V.—William H. Pitts, Woodhorn, Oving, Chichester.
2333 R.N.—Col. Sir S. Wishart, Church Farm, Binsted, Arundel.
H.C.—2320, 2325, 2326.

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[1] Champion Gold Medal, or £10 10*s*. in cash, given by the Southdown Sheep Society for the best Ram or Ram Lamb in Classes 260 to 262.
[2] The "Northumberland" Perpetual Silver Challenge Cup given through the Southdown Sheep Society for the best exhibit.
[3] Prizes, except Fourth and Fifth, given by the Southdown Sheep Society.
[4] Champion Silver Medal, or £1 in cash, given by the Southdown Sheep Society for the best Pen of Ewes or Ewe Lambs.

Hampshire Downs.

Class 267.—*Hampshire Down Shearling Rams.*

2337 I.—E. Clifton-Brown, Burnham Grove, Burnham, Bucks.
2340 II.—G. Meredyth Hope, Basildon Home Farm, Pangbourne.
2334 III.—J. H. Benyon, Englefield House, Reading, for **Englefield Design M. 103**, bred by the Exors. of J. Goldsmith, Manor Farm, Clanfield, Portsmouth.
2341 R.N.—P. C. Tory, Shapwick, Blandford.
H.C.—2338, 2339, 2342.

Class 268.—*Hampshire Down Ram Lambs.*

2352 I.—P. C. Tory, Shapwick, Blandford.
2343 II.—J. H. Benyon, Englefield House, Reading.
2351 III.—A. Thomas Loyd, Lockinge House, Wantage.
2347 R.N.—E. Clifton-Brown, Burnham Grove, Burnham, Bucks.
H.C.—2344, 2348, 2353. C.—2345, 2346, 2349, 2350.

Class 269.—*Three Hampshire Down Ram Lambs.*

2359 I. & Champion.[1]—A. Thomas Loyd, Lockinge House, Wantage.
2354 II.—J. H. Benyon, Englefield House, Reading.
2360 III.—P. C. Tory, Shapwick, Blandford.
2358 R.N.—G. Meredyth Hope, Basildon Home Farm, Pangbourne.
H.C.—2355, 2356.

Class 270.—*Three Hampshire Down Shearling Ewes.*

2361 I. & 2362 III.—E. Clifton-Brown, Burnham Grove, Burnham, Bucks.
2363 II.—P. C. Tory, Shapwick, Blandford.

Class 271.—*Three Hampshire Down Ewe Lambs.*

2364 I. & R.N. for Champion.[1]—J. H. Benyon, Englefield House, Reading.
2366 II.—E. Clifton-Brown, Burnham Grove, Burnham, Bucks.
2365 III.—Major V. S. Bland, M.C., The Warren, Aldbourne, Marlborough.
2368 R.N.—A. Thomas Loyd, Lockinge House, Wantage.
H.C.—2369.

Suffolks.[2]

Class 272.—*Suffolk Two Shear Rams.*

2373 I. & Champion.[3]—John R. Keeble & Son, Brantham Hall, Manningtree, for **Yeldham Gold Guard 22725**, bred by G. A. Goodchild, Great Yeldham, Essex.
2376 II.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Wratting Rightplace 23301.**
2375 III.—Stuart Paul, Kirton Lodge, Ipswich, for **Ashbocking John 22785**, bred by John Long, Ashbocking, Ipswich.
2371 R.N.—The Earl of Ellesmere, Stetchworth Park, Newmarket, for **Stetchworth Excelsior.**

Class 273.—*Suffolk Shearling Rams.*

2385 I.—John Long, The Poplars, Ashbocking, Ipswich, for **Ashbocking Fingringhoe Perfect 23211.**
2389 II.—Sir Prince Prince-Smith, Bart., Southburn House, Driffield.
2391 III.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Wratting Supreme 23417.**
2379 IV.—Capt. A. S. Cunningham-Reid, M.P., Westley Lodge, Six Mile Bottom, Cambs., for **Carlton Fad.**
2387 V.—Stuart Paul, Kirton Lodge, Ipswich.
2383 R.N.—Hollesley Bay Labour Colony, Hollesley, Woodbridge, for **Colony Field Marshal.**

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[1] Champion Prize of £10 given by the Hampshire Down Sheep Breeders' Association for the best exhibit.
[2] £69 towards these Prizes were given by the Suffolk Sheep Society.
[3] Champion Prize of £10 given by the Suffolk Sheep Society for the best Male exhibit.

Class 274.—*Suffolk Ram Lambs.*

2402 I. £15.—Hollesley Bay Labour Colony, Hollesley, Woodbridge.
2411 II. £10, & 2412 R.N.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill.
2407 III. £7.—Stuart Paul, Kirton Lodge, Ipswich.
2406 IV. £5.—John Long, The Poplars, Ashbocking, Ipswich.
2403 V. £3.—John R. Keeble & Son, Brantham Hall, Manningtree.
H.C.—2396, 2398.

Class 275.—*Suffolk Ram Lambs Untrimmed.*

2421 I.—G. A. Goodchild, Great Yeldham Hall, Great Yeldham, Essex.
2419 II.—Edwin Giles, Sladburys Farm, Great Clacton, Essex.
2423 III.—John R. Keeble & Son, Brantham Hall, Manningtree.
2415 IV.—R. H. Brittain, Gulpher, Felixstowe.
2429 V., & 2430 R.N.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill.
H.C.—2425, 2427, 2431.

Class 276.—*Three Suffolk Ram Lambs.*

2433 I. £15.—The Earl of Ellesmere, Stetchworth Park, Newmarket.
2443 II. £10.—John R. Keeble & Son, Brantham Hall, Manningtree.
2438 III. £7.—G. A. Goodchild, Great Yeldham Hall, Great Yeldham, Essex.
2436 IV. £5.—Edwin Giles, Sladburys Farm, Great Clacton, Essex.
2448 V. £3.—Stuart Paul, Kirton Lodge, Ipswich.
2450 R.N.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill.

Class 277.—*Three Suffolk Ram Lambs Untrimmed.*

2451 I. & R.N. for Champion.[1]—The Earl of Ellesmere, Stetchworth Park, Newmarket.
2453 II.—G. A. Goodchild, Great Yeldham Hall, Great Yeldham, Essex.
2455 III.—John R. Keeble & Son, Brantham Hall, Manningtree.
2459 IV.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill.
2457 R.N.—John Long, The Poplars, Ashbocking, Ipswich.

Class 278.—*Three Suffolk Shearling Ewes.*

2462 I. £15, Champion[2] & Champion,[3] & 2463 R.N.—The Earl of Ellesmere, Stetchworth Park, Newmarket.
2466 II. £10, R.N. for Champion[2] & R.N. for Champion.[3]—Hollesley Bay Labour Colony, Hollesley, Woodbridge.
2468 III. £5.—Stuart Paul, Kirton Lodge, Ipswich.
2467 IV. £2.—John R. Keeble & Son, Brantham Hall, Manningtree.

Class 279.—*Three Suffolk Ewe Lambs.*

2474 I. £15.—Edwin Giles, Sladburys Farm, Great Clacton, Essex.
2472 II. £10.—The Earl of Ellesmere, Stetchworth Park, Newmarket.
2484 III. £5.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill.
2479 IV. £2.—John R. Keeble & Son, Brantham Hall, Manningtree.
2478 V. £1.—Hollesley Bay Labour Colony, Hollesley, Woodbridge.
2481 R.N.—John Long, The Poplars, Ashbocking, Ipswich.

Class 280.—*Three Suffolk Ewe Lambs Untrimmed.*

2491 I.—John R. Keeble & Son, Brantham Hall, Manningtree.
2489 II.—G. A. Goodchild, Great Yeldham Hall, Great Yeldham, Essex.
2486 III.—The Earl of Ellesmere, Stetchworth Park, Newmarket.
2487 IV.—Edwin Giles, Sladburys Farm, Great Clacton, Essex.
2496 V.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill.
2494 R.N.—John Long, The Poplars, Ashbocking, Ipswich.
H.C.—2497.
Cup.[4]—The Earl of Ellesmere.
R.N. for Cup.[4]—John R. Keeble & Son.

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[1] Champion Prize of £10 given by the Suffolk Sheep Society for the best Male exhibit.
[2] Champion Prize of £10 given by the Suffolk Sheep Society for the best Female exhibit.
[3] Perpetual Challenge Plate and £5 in cash and a Champion Prize of £5 given by the Suffolk Sheep Society for the best exhibit.
[4] The "Southburn" Silver Challenge Cup given through the Suffolk Sheep Society for the most points awarded in a combination of entries.

Dorset Downs.

Class 281.—*Dorset Down Rams, Shearling and Upwards.*

2500 I. & Champion.[1]—MRS. LIONEL DE ROTHSCHILD, Exbury House, Southampton, for ram, born in 1933.
2501 II.—THE EARL OF ELGIN, K.T., C.M.G., Broomhall, Dunfermline, for ram, born in 1933.
2502 III.—JOHN JOYCE, Milverton, Somerset, for ram, born in 1933.

Class 282.—*Dorset Down Ram Lambs.*[2]

2503 I. & R.N. for Champion.[1]—MRS. LIONEL DE ROTHSCHILD, Exbury House, Southampton.
2506 II. & 2507 R.N.—P. & C. SEWARD, Weston, Petersfield, Hants.
2505 III.—JOHN JOYCE, Milverton, Somerset.
H.C.—2504.

Class 283.—*Dorset Down Shearling Ewes.*

2513 I.—JOHN JOYCE, Milverton, Somerset.
2510 II. & 2509 R.N.—MRS. LIONEL DE ROTHSCHILD, Exbury House, Southampton.
2511 III.—THE EARL OF ELGIN, K.T., C.M.G., Broomhall, Dunfermline.
H.C.—2512.

Dorset Horns.

Class 284.—*Two Dorset Horn Ram Lambs, born on or after October* 1, 1933.[3]

2515 I. & R.N. for Champion,[4] & 2516 II.—W. RUPERT TORY, Clenstone Manor, Blandford.
2514 III.—THE EARL OF ELGIN, K.T., C.M.G., Broomhall, Dunfermline.

Class 285.—*Two Dorset Horn Shearling Ewes, born on or after October* 1, 1932.

2521 I. & 2520 II.—W. RUPERT TORY, Clenstone Manor, Blandford.
2519 III.—G. A. TOOSE, Highleaze Farm, Brympton, Yeovil.
2517 R.N.—THE EARL OF ELGIN, K.T., C.M.G., Broomhall, Dunfermline.

Class 286.—*Two Dorset Horn Ewe Lambs, born on or after October* 1, 1933.

2523 I. & Champion,[4] & 2524 II.—W. RUPERT TORY, Clenstone Manor, Blandford.
2522 III.—THE EARL OF ELGIN, K.T., C.M.G., Broomhall, Dunfermline.

Wiltshire Horns.

Class 287.—*Wiltshire Horn Rams, Two Shear and Upwards.*[5]

2525 I.—BRODIE BROS., Brockhall, Flore, Northants., for Wern Defender 3265, born in 1932, bred by John Owen, Menai Bridge.
2526 II.—ALAN GOWLING, Snowford Hall, Leamington Spa, for Snowford Sunbeam 2nd 3189, born in 1932.
2527 III.—WILLIAM MORRIS, Tarry Lane, Yelvertoft, Rugby, for Gedwydd Warrior 3269, born in 1932, bred by R. H. Owen, Bodgedwydd, Ty Croes.

Class 288.—*Wiltshire Horn Shearling Rams.*

2530 I.—ALAN GOWLING, Snowford Hall, Leamington Spa, for Yelvertoft Surprise 2nd 3400, bred by W. Evans, Yelvertoft, Rugby.
2528 II.—BRODIE BROS., Brockhall, Flore, Northants., for Trefor Swell 3459, bred by W. H. Jones, Trefor, Wem.
2532 III.—W. B. SOUTHERNWOOD & SON, Gubblecote, Tring, for Yelvertoft Surprise, bred by W. Evans, Yelvertoft, Rugby.

Class 289.—*Two Wiltshire Horn Shearling Ewes.*

2536 I. & 2537 III.—W. B. SOUTHERNWOOD & SON, Gubblecote, Tring.
2533 II.—BRODIE BROS., Brockhall, Flore, Northants., for ewes, bred by S. K. Spokes, Upton, Northants.
2534 R.N.—ALAN GOWLING, Snowford Hall, Leamington Spa.

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[1] Champion Prize of £5 given by the Dorset Down Sheep Breeders' Association for the best exhibit.
[2] Prizes given by the Dorset Down Sheep Breeders' Association.
[3] Prizes given by the Dorset Horn Sheep Breeders' Association.
[4] Champion Prize of £5 given by the Dorset Horn Sheep Breeders' Association for the best exhibit.
[5] Prizes given by the Wiltshire Horn Sheep Society.

Ryelands.

Class 290.—*Ryeland Rams, Two Shear and Upwards.*

2540 I.—DAVID J. THOMAS, Monachty, Abergavenny, for Thomas' Pilot, born in 1932.
2539 II.—DAVID J. THOMAS, for Thomas' O.K. 3002, born in 1931.
2538 III.—HUBERT GROOM, Warham, Wells, Norfolk, for Docking Minstrel, born in 1932.

Class 291.—*Ryeland Shearling Rams.*

2547 I. & Champion.[1]—DAVID J. THOMAS, Monachty, Abergavenny, for Thomas' Quarto.
2545 II. & R.N. for Champion.[1]—T. W. MONTAGUE PERKINS, Ufton Court, Holme Lacy, Hereford, for Holmelacy Leo.
2548 III.—DAVID J. THOMAS, for Thomas' Quota.
2544 R.N.—T. W. MONTAGUE PERKINS, for Holmelacy Lavington.
H.C.—2541, 2546.

Class 292.—*Three Ryeland Ram Lambs.*

2550 I.—T. W. MONTAGUE PERKINS, Ufton Court, Holme Lacy, Hereford.
2551 II.—DAVID J. THOMAS, Monachty, Abergavenny.
2549 III.—HUBERT GROOM, Warham, Wells, Norfolk.

Class 293.—*Three Ryeland Shearling Ewes.*

2555 I.—T. W. MONTAGUE PERKINS, Ufton Court, Holme Lacy, Hereford.
2554 II.—CRAWFORD R. L. PERKINS, Lugwardine Court, Hereford.
2552 III.—HUBERT GROOM, Warham, Wells, Norfolk.
2553 R.N.—LT.-COL. R. C. O. PARKER, Bradwell Hall, Braintree.

Class 294.—*Three Ryeland Ewe Lambs.*

2559 I.—T. W. MONTAGUE PERKINS, Ufton Court, Holme Lacy, Hereford.
2558 II.—CRAWFORD R. L. PERKINS, Lugwardine Court, Hereford.
2556 III.—HUBERT GROOM, Warham, Wells, Norfolk.
2557 R.N.—LT.-COL. R. C. O. PARKER, Bradwell Hall, Braintree.

Kerry Hills (Wales).

Class 295.—*Kerry Hill (Wales) Rams, Two Shear and Upwards.*

2563 I. & R.N. for Champion.[2]—J. W. OWENS, Woodhouse, Shobdon, Herefordshire, for Uphampton Optimist 17780, born in 1932, bred by P. E. Pugh, Uphampton.
2564 II.—THOMAS WILLIAMS, The Gaer, Forden, Welshpool, for Uphampton Olympus 17778, born in 1932, bred by P. E. Pugh, Uphampton.
2561 III.—JOHN T. BEAVAN, Winsbury, Chirbury, Montgomery, for Jamesford Namesake 16891, born in 1931, bred by P. T. Pugh, Jamesford, Montgomery.
2562 R.N.—J. N. KENDALL, Brimpsfield Park, Glos., for Lydbury North Factor.

Class 296.—*Kerry Hill (Wales) Shearling Rams.*

2565 I.—JOHN T. BEAVAN, Winsbury, Chirbury, Montgomery, for Winsbury Posh.
2570 II.—THOMAS WILLIAMS, The Gaer, Forden, Welshpool, for Gaer Optimist.
2569 III.—H. C. PILKINGTON, Bryntanat, Llansantffraid, Mont., for Tanatside Merriman.
2568 R.N.—J. W. OWENS, Woodhouse, Shobdon, Herefordshire, for Stockley Quibbler.

Class 297.—*Kerry Hill (Wales) Ram Lambs.*

2571 I.—JOHN T. BEAVAN, Winsbury, Chirbury, Montgomery, for Winsbury Quest.
2573 II.—J. W. OWENS, Woodhouse, Shobdon, Herefordshire, for Stockley Rambler.
2575 III.—H. C. PILKINGTON, Bryntanat, Llansantffraid, Mont., for Tanatside Nobby.
2574 R.N.—J. W. OWENS, for Stockley Rover.
H.C.—2576.

Class 298.—*Three Kerry Hill (Wales) Shearling Ewes.*

2578 I. & Champion,[2] & 2577 III.—JOHN T. BEAVAN, Winsbury, Chirbury, Montgomery.
2580 II.—J. W. OWENS, Woodhouse, Shobdon, Herefordshire.
2581 R.N.—H. C. PILKINGTON, Bryntanat, Llansantffraid, Mont.
H.C.—2579.

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[1] Silver Challenge Cup given through the Ryeland Flock Book Society for the best Shearling Ram.
[2] Silver Challenge Cup given through the Kerry Hill (Wales) Flock Book Society for the best exhibit.

Class 299.—*Three Kerry Hill (Wales) Ewe Lambs.*[1]

2583 I.—JOHN T. BEAVAN, Winsbury, Chirbury, Montgomery.
2585 II.—H. C. PILKINGTON, Bryntanat, Llansantffraid, Mont.
2584 III.—J. W. OWENS, Woodhouse, Shobdon, Herefordshire.
2586 R.N.—THOMAS WILLIAMS, The Gaer, Forden, Welshpool.

Clun Forest.

Class 300.—*Clun Forest Rams, Shearling and Upwards.*

2588 I.—T. E. GWILLIM, Ffostill, Talgarth, Brecon, for **Glan Briton**, born in 1932, bred by Miss E. A. Rossiter, Glen Alva, Pontrilas, Hereford.
2592 II.—D. POWELL, Lower Kimbolton, Leominster, for **Letton Ideal 2432**, born in 1932, bred by M. Morgan, Lower Letton, Bucknell.
2590 III.—W. R. LYKE, Lawton Bury, Leominster, for **Ensign of Lawton Bury**, born in 1933.
H.C.—2587. C.—2591.

Class 301.—*Three Clun Forest Shearling Ewes.*[2]

2596 I.—E. J. SHERWOOD, Beaconsfield, Battlefield, Shrewsbury.
2594 II.—W. R. LYKE, Lawton Bury, Leominster.
2595 III.—H. J. MARSH & SON, Bedstone, Bucknell, Shropshire.
2593 R.N.—T. E. GWILLIM, Ffostill, Talgarth, Brecon.
H.C.—2597.

Lincolns.

Class 302.—*Lincoln Two Shear Rams.*

2602 I. & R.N. for Champion.[3]—CLIFFORD NICHOLSON, Willoughton Manor, Lincoln, for **Horkstow Manor No. 147 18873.**
2600 II.—FRANCIS CARBUTT, Rothwell Grange, Caistor, Lincs., for **Rothwell Monarch 18904**, bred by Ernest Addison, Riby Grange, Stallingboro'.
2599 III.—D. F. BROWETT, Thornton House, Thornton, Horncastle, for **Thornton Record 18915.**

Class 303.—*Lincoln Shearling Rams.*

2604 I. & Champion[3] & 2603 III.—ERNEST ADDISON, Riby Grange, Stallingboro', Lincs
2607 II.—CLIFFORD NICHOLSON, Willoughton Manor, Lincoln.
2605 R.N.—D. F. BROWETT, Thornton House, Thornton, Horncastle.

Class 304.—*Three Lincoln Shearling Rams.*

2608 I.—ERNEST ADDISON, Riby Grange, Stallingboro', Lincs.
2612 II.—CLIFFORD NICHOLSON, Willoughton Manor, Lincoln.
2609 III.—D. F. BROWETT, Thornton House, Thornton, Horncastle.
2611 R.N.—FRANCIS CARBUTT, Rothwell Grange, Caistor, Lincs.

Class 305.—*Three Lincoln Ram Lambs.*

2616 I.—CLIFFORD NICHOLSON, Willoughton Manor, Lincoln.
2613 II.—ERNEST ADDISON, Riby Grange, Stallingboro', Lincs.
2614 III.—D. F. BROWETT, Thornton House, Thornton, Horncastle.

Class 306.—*Three Lincoln Ewe Lambs.*

2618 I.—ERNEST ADDISON, Riby Grange, Stallingboro', Lincs.
2620 II.—CLIFFORD NICHOLSON, Willoughton Manor, Lincoln.
2619 III.—D. F. BROWETT, Thornton House, Thornton, Horncastle.

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[1] Prizes give by the Kerry Hill (Wales) Flock Book Society.
[2] Prizes given by the Clun Forest Sheep Breeders' Society.
[3] Champion Prize of £5 given by the Lincoln Longwool Sheep Breeders' Association for the best exhibit.

Leicesters.

Class 307.—*Leicester Shearling Rams.*

2623 I. & Champion.[1]—R. Megginson, Garton Field, Driffield.
2622 II. & R.N. for Champion.[1]—William Jordan, Eastburn, Driffield.
2621 III.—F. W. Dennis, 43, Aberdeen Walk, Scarborough.

Class 308.—*Leicester Ram Lambs.*

2626 I.—R. Megginson, Garton Field, Driffield.
2625 II.—William Jordan, Eastburn, Driffield.
2624 III.—F. W. Dennis, 43, Aberdeen Walk, Scarborough.

Class 309.—*Leicester Shearling Ewes.*

2629 I.—R. Megginson, Garton Field, Driffield.
2628 II.—William Jordan, Eastburn, Driffield.
2627 III.—F. W. Dennis, 43, Aberdeen Walk, Scarborough.

Class 310.—*Leicester Ewe Lambs.*

2631 I.—William Jordan, Eastburn, Driffield.
2632 II.—R. Megginson, Garton Field, Driffield.
2630 III.—F. W. Dennis, 43, Aberdeen Walk, Scarborough.

Border Leicesters.

Class 311.—*Border Leicester Rams, Two Shear and Upwards.*

2637 I.—James Howie & Sons, Muirside, Dumfries, for ram, born in 1932, bred by T. & M. Templeton, Sandyknowe, Kelso.
2633 II.—R. C. Cameron, Greenlawdean, Greenlaw, Berwickshire, for **Greenlaw Bosun** 9538, born in 1931.
2638 III.—Robert Wilson, Dockrayrigg, Wigton, for **Bogardo Silver** 9437, born in 1931, bred by James Findlay, Bogardo, Forfar.

Class 312.—*Border Leicester Shearling Rams.*

2642 I. & Champion.[2]—A. B. Howie, Eshott Brocks, Felton, Morpeth.
2640 II.—Robert Cross, Knockdon, Maybole.
2644 III.—James Howie & Sons, Muirside, Dumfries, for **Morriston Surprise**, bred by A. T. Dunlop, Morriston, Maidens, Ayrshire.
2639 R.N.—R. C. Cameron, Greenlawdean, Greenlaw, Berwickshire.

Class 313.—*Border Leicester Ewes, Two Shear and Upwards.*[3]

2649 I. & R.N. for Champion.[2]—A. B. Howie, Eshott Brocks, Felton, Morpeth, for ewe, born in 1932.
2647 II.—Robert Cross, Knockdon, Maybole, for ewe, born in 1931.
2650 III.—Robert Wilson, Dockrayrigg, Wigton, for ewe, born in 1930.

Class 314.—*Border Leicester Shearling Ewes.*

2654 I.—A. B. Howie, Eshott Brocks, Felton, Morpeth.
2656 II.—James Howie & Sons, Muirside, Dumfries, for ewe, bred by T. & M. Templeton Sandyknowe, Kelso.
2651 III.—R. C. Cameron, Greenlawdean, Greenlaw, Berwickshire.
2652 R.N.—Robert Cross, Knockdon, Maybole.

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[1] Champion Prize of a Piece of Plate given by the Leicester Sheep Breeders' Association for the best exhibit.
[2] Perpetual Silver Challenge Cup and a Gold Medal given by the Society of Border Leicester Sheep Breeders for the best Ram or Ewe.
[3] Prizes given by the Society of Border Leicester Sheep Breeders.

Wensleydales.

Class 315.—*Wensleydale Rams, Two Shear and Upwards.*

2658 I. & Champion.[1]—John Dargue, Burneside Hall, Kendal, for **Burneside Commander** 3994, born in 1932.
2662 II. & R.N. for Champion.[1]—James C. Waddington, Westwood, 462, Padiham Road, Burnley, for **Houlkers** 4007, born in 1932, bred by J. A. Willis, Manor House, Carperby, Yorks.
2659 III.—John W. Greensit, Holme-on-Swale, Thirsk, for **Carperby Cavalier** 3940, born in 1931, bred by J. A. Willis, Manor House, Carperby, Yorks.
2661 R.N.—J. B. Smalley, Birkby Hall, Cark-in-Cartmel, Carnforth, for **Birkby Prince Christian.**

Class 316.—*Wensleydale Shearling Rams.*

2668 I.—John Dargue, Burneside Hall, Kendal.
2670 II.—John A. Willis, Manor House, Carperby, Yorks., for ram, bred by John Dinsdale, Low Bolton, Redmire.
2665 III.—John W. Greensit, Holme-on-Swale, Thirsk.
2666 R.N.—John Percival, Easthouse, Carperby, Yorks.

Class 317.—*Three Wensleydale Shearling Rams.*

2671 I.—John Dargue, Burneside Hall, Kendal.
2673 II.—John Percival, Easthouse, Carperby, Yorks., for rams, bred by John Hargrave, Wath, Ripon.
2672 III.—John W. Greensit, Holme-on-Swale, Thirsk.

Class 318.—*Wensleydale Shearling Ewes.*

2674 I.—John Dargue, Burneside Hall, Kendal.
2679 II.—John A. Willis, Manor House, Carperby, Yorks.
2675 III. & 2676 R.N.—John W. Greensit, Holme-on-Swale, Thirsk.

Class 319.—*Wensleydale Yearling Ewes, shown in Wool.*[2]

2683 I.—John A. Willis, Manor House, Carperby, Yorks., for ewe, bred by John Hargrave, Wath, Ripon.
2680 II. & 2681 III.—John W. Greensit, Holme-on-Swale, Thirsk.
2682 R.N.—J. B. Smalley, Birkby Hall, Cark-in-Cartmel.

Kent or Romney Marsh.

Class 320.—*Kent or Romney Marsh Two Shear Rams.*

2687 I.—J. Egerton Quested, The Firs, Cheriton, Kent, for **Quested's 122 of 1932** 75899.
2688 II.—J. Egerton Quested, for **Quested's 271 of 1932** 75942.
2686 III.—Clifford Nicholson, Willoughton Manor, Lincoln, for **Horkstow Manor No. 141 of 1932** 76665.
2685 R.N.—Clifford Nicholson, for **Horkstow Manor No. 65 of 1932** 76651.
C.—2684.

Class 321.—*Kent or Romney Marsh Shearling Rams.*

2694 I. & Champion,[3] 2695 II. & R.N. for Champion,[3] & 2696 IV.—J. Egerton Quested, The Firs, Cheriton, Kent.
2698 III.—Ashley Stevens, Davington Hall, Faversham.
2691 R.N.—William Miller, Renville, Canterbury.
C.—2690.

Class 322.—*Three Kent or Romney Marsh Shearling Rams.*[4]

2707 I. £20.—Ashley Stevens, Davington Hall, Faversham.
2699 II. £15.—E. W. Baker, Parsonage Farm, Bekesbourne, Canterbury.
2703 III. £10 & 2704 R.N.—J. Egerton Quested, The Firs, Cheriton, Kent.
2700 IV. £5.—William Miller, Renville, Canterbury.

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[1] Silver Challenge Trophy and a Gold Medal given by the Wensleydale Longwool Sheep Breeders' Association for the best exhibit.
[2] Prizes given by the Wensleydale Longwood Sheep Breeders' Association.
[3] Champion Prize of £10 10*s.* given by the Kent or Romney Marsh Sheep Breeders' Association for the best Ram in Classes 320 and 321.
[4] Prizes given by the Kent or Romney Marsh Sheep Breeders' Association.

Class 323.—*Three Kent or Romney Marsh Ram Lambs.*

2712 I. & 2713 R.N.—J. EGERTON QUESTED, The Firs, Cheriton, Kent.
2710 II.—CLIFFORD NICHOLSON, Willoughton Manor, Lincoln.
2709 III.—WILLIAM MILLER, Renville. Canterbury.
C.—2711.

Class 324.—*Three Kent or Romney Marsh Shearling Ewes.*

2717 I. & Champion,[1] & 2718 R.N.—J. EGERTON QUESTED, The Firs, Cheriton, Kent.
2719 II. & R.N. for Champion.[1]—ASHLEY STEVENS, Davington Hall, Faversham.
2715 III.—CLIFFORD NICHOLSON, Willoughton Manor, Lincoln.

Class 325.—*Three Kent or Romney Marsh Ewe Lambs.*

2724 I. & 2723 III.—J. EGERTON QUESTED, The Firs, Cheriton, Kent.
2722 II. & 2721 R.N.—CLIFFORD NICHOLSON, Willoughton Manor, Lincoln.

Devon Close Wools.

Class 326.—*Devon Close Wool Rams, Shearling and Upwards.*

2727 I.—A. R. LERWILL, Maddox Down, East Down, Barnstaple, for ram, born in 1933.
2725 II.—F. R. FRY, Wigmore Farm, East Down, Barnstaple, for ram, born in 1933.
2726 III.—A. L. LERWILL, Stone Combe, East Down, Barnstaple, for ram, born in 1933.

Class 327.—*Devon Close Wool Shearling Ewes.*

2728 I.—F. R. FRY, Wigmore Farm, East Down, Barnstaple.
2730 II.—A. R. LERWILL, Maddox Down, East Down, Barnstaple.
2729 III.—A. L. LERWILL, Stone Combe, East Down, Barnstaple.

South Devons.

Class 328.—*South Devon Shearling Rams.*

2733 I.—A. C. LANYON, Coswarth, St. Columb, Cornwall.
2732 II.—J. N. GROSE, Penare, Gorran, Cornwall.
2731 III.—W. C. BICE & SON, Nanswhyden, St. Columb, Cornwall, for Nanswhyden No. 11 of 1933 24452.

Class 329.—*South Devon Shearling Ewes, shown in Wool.*

2736 I.—A. C. LANYON, Coswarth, St. Columb, Cornwall.
2734 II.—J. N. GROSE, Penare, Gorran, Cornwall.
2735 III.—WILLIAM HAWKE, Besoughan, Colan, St. Columb, Cornwall.

Dartmoors.

Class 330.—*Dartmoor Rams, Shearling and Upwards.*

2739 I.—R. P. LUCE, Lower Chaddlehanger, Tavistock, for Chaddlehanger Kinsman 5016, born in 1933.
2738 II.—HENRY J. KINGWELL, Great Aish, South Brent, Devon, for Chaddlehanger Jaunty 4853, born in 1932, bred by R. P. Luce, Lower Chaddlehanger, Tavistock.
2737 III.—GEORGE GLANFIELD, West Lake, Okehampton, for Thorne No. 6 4915, born in 1932, bred by J. Knapman & Son, Thorne, Throwleigh, Okehampton.
2740 R.N.—R. P. LUCE, for Chaddlehanger Knave.

Class 331.—*Dartmoor Shearling Ewes.*

2742 I.—J. KNAPMAN & SON, Thorne, Throwleigh, Okehampton.
2741 II.—E. S. ELLACOTT & SONS, Tregragon, Delabole, Cornwall, for Tregragon 198.
2743 III. & 2744 R.N.—R. P. LUCE, Lower Chaddlehanger, Tavistock.

[1] Champion Prize of £10 10*s.* given by the Kent or Romney Marsh Sheep Breeders' Association for the best Pen of Ewes or Ewe Lambs.

Welsh Mountain.

Class 334.—*Welsh Mountain Rams, Shearling and Upwards.*

2749 I.—UNIVERSITY COLLEGE OF NORTH WALES, College Farm, Aber, Caernarvonshire, for Snowdon D. 57 4687, born in 1931.
2745 II.—MAJOR ERIC J. W. PLATT, Madryn Farm, Aber, Caernarvonshire, for Arllen F. 1 4611, born in 1932, bred by Robert Roberts & Son, Arllen Fawr, Llanrhaiadr, Oswestry.
2747 III.—MAJOR ERIC J. W. PLATT, for Madryn F. 12 4572, born in 1932.
H.C.—2746. C.—2748.

Class 335.—*Three Welsh Mountain Shearling Ewes.*

2750 I. & 2751 III.—LLYSFASI FARM INSTITUTE, Ruthin, North Wales.
2752 II.—MAJOR ERIC J. W. PLATT, Madryn Farm, Aber, Caernarvonshire.
2753 R.N.—UNIVERSITY COLLEGE OF NORTH WALES, College Farm, Aber, Caernarvonshire.
C.—2755.

Black Welsh Mountain.

Class 336.—*Black Welsh Mountain Shearling Rams.*

2758 I. & 2759 III.—MRS. JERVOISE, Herriard Park, Basingstoke.
2757 II.—MAJOR F. H. T. JERVOISE, Herriard Park, Basingstoke.
2756 R.N.—MAJOR CLIVE BEHRENS, Swinton Grange, Malton.

Class 337.—*Three Black Welsh Mountain Shearling Ewes.*[1]

2760 I.—MAJOR CLIVE BEHRENS, Swinton Grange, Malton.
2762 II.—MAJOR F. H. T. JERVOISE, Herriard Park, Basingstoke.
2763 III.—MRS. JERVOISE, Herriard Park, Basingstoke.

PIGS.

The Prizes in each Class for Pigs are: First, £10; Second, £5; Third, £3; Fourth, £2; Fifth, £1.

[*The numbers in brackets refer to the Tattoo or Ear Numbers of the Animals.*]

Large Whites.

Class 338.—*Large White Boars, born in or before 1932.*

2767 I., Champion[2] & R.N. for Champion.[3]—LORD DARESBURY, C.V.O., Walton Hall, Warrington, for Walton Hercules 31st 86181 (8275), born Jan. 20, 1932; *s.* Walton Hercules 14th 78197, *d.* Walton May 6th 208206 *by* Walton Boy 39th 66159.
2766 II. & R.N. for Champion.[2]—LORD DARESBURY, C.V.O., for Walton Boy 75th 78157 (2722), born Jan. 17, 1931; *s.* Walton Boy 39th 66159, *d.* Moreton May 10th 171354 *by* Bourne Baldwin 52255.
2770 III.—ROWLAND P. HAYNES, Delves Green Farm, Walsall, for Caldmore King David 29th 75887 (4336), born May 20, 1930; *s.* Wall King David 9th 70085, *d.* Cutthorpe Bashful Lady 24th 145958 *by* Jay of Cutthorpe 37223.
2778 IV.—W. L. VAWSER, Regent Avenue, March, Cambs., for Spalding Banner 33rd (2107), born April 12, 1932, bred by Alfred W. White, Hillegom, Spalding; *s.* Spalding Banner 21st 72859, *d.* Spalding Superior 7th 196750 *by* Spalding Bob 11th 53617.
2777 V.—E. THOMLINSON, Hall Farm, Hutton Wandesley, Marston, York, for Wall King David 46th 81631 (5166), born July 26, 1931, bred by W. W. Ryman, Wall, Lichfield; *s.* Bourne King David 12th 40515, *d.* Wall Champion Queen 8th 208024 *by* Wall Jay 27th 66101.
2769 R.N.—ERNEST HARDING, Packwooc Grange, Dorridge, Birmingham, for Packwood Recorder 10th.
H.C.—2768. C.—2773, 2780, 2782.
2794, 2870, 2889, 2924 Special I.[4]—WALTER W. RYMAN, for Wall King David 59th, Wall Maid 5th, Wall Brocade and Wall Champion Queen 24th.
2767, 2801, 2862, 2909 Special II.[3]—LORD DARESBURY, C.V.O., for Walton Hercules 31st, Walton Lion 18th, Walton Mary 27th and Walton Queen Mary 59th.

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[1] Prizes given by the Black Welsh Mountain Sheep Breeders' Association.
[2] Champion Gold Medal, or £5 cash, given by the National Pig Breeders' Association for the best Large White Boar.
[3] Silver Challenge Cup given by the National Pig Breeders' Association for the best Large White Pig.
[4] Special Prizes of a Cup or £10 cash (First Prize) and £5 (Second Prize) given by the National Pig Breeder's Association for the best groups of four Pigs, bred by Exhibitor. One Boar (at least) had to be included in each group, and not more than one entry selected from any one Class.

Class 339.—*Large White Boars, born in 1933, before July 1.*

2793 I.—J. Pierpont Morgan, Wall Hall, Aldenham, Watford, for **Aldenham Bradbury 25th** 82799 (5667), born Jan. 16; *s.* Aldenham Bradbury 15th 75459, *d.* Aldenham Beryl 187862 *by* Aldenham Brigadier 55669.
2794 II.—Walter W. Ryman, Wall, Lichfield, for **Wall King David 59th** (5860), born Jan 5; *s.* Wall King David 46th 81631, *d.* Packwood Brocade 87th 206562 *by* Wentworth Masterpiece 10th 70249.
2795 III.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Wratting King David 18th** (744), born Jan. 26; *s.* Wratting King David 5th 78741, *d.* Creek Belle 78th 212472 *by* Westacre Bradbury 206th 70267.
2792 IV.—Rowland P. Haynes, Delves Green Farm, Walsall, for **Whittingham Turk 35th** 86889 (2075), born Jan. 23, bred by Whittingham Asylum Farm Committee, Preston; *s.* Caldmore Turk 8th 75899, *d.* Whittingham Jewel 5th 197876 *by* Wall King 66123.
2790 V.—W. Hallas, Bank House Farm, Helsby, Warrington, for **Hallastone Premier 44th** 84097 (3110), born Jan. 4; *s.* Westacre Premier 3rd 81889, *d.* Hallastone Madam 7th 205152 *by* Hallastone Victor 26th 65139.
2789 R.N.—Lord Daresbury, C.V.O., Walton Hall, Warrington, for **Barfield Prince George 4th.**
H.C.—2787. C.—2786, 2788.

Class 340.—*Large White Boars, born in 1933, on or after July 1.*[1]

2801 I.—Lord Daresbury, C.V.O., Walton Hall, Warrington, for **Walton Lion 18th** (3975), born July 1; *s.* Wall Lion 35th 85997, *d.* Milton Bounty 14th 223848 *by* Debdale King David 4th 71243.
2816 II.—Alfred W. White, Hillegom, Spalding, for **Spalding Bradbury 41st** (3201), born July 7; *s.* Aldenham Bradbury 9th 70629, *d.* Spalding Queen 215414 *by* Histon King David 43rd 69173.
2800 III.—Chivers & Sons, Ltd., Histon, Cambridge, for **South Eau Historian** (596), born Aug. 18, bred by Barter & Guion, South Eau Farm, Crowland, Lincs.; *s.* Histon Prefect 2nd 80519, *d.* Creek Belle 77th 212470 *by* Histon Kitchener 26th 72003.
2817 IV.—H. W. White, Weston Hills, Spalding, for **Weston Bob 21st** (173), born July 10; *s.* Weston Bob 17th 86279, *d.* Ramsey Belle 116th 206858 *by* Histon King David 33rd 65255.
2819 V.—W. White & Son, Pool Farm, Taunton, for **Taunton Bradbury 39th** (817), born July 11; *s.* Fen Bradbury 10th 60773, *d.* Taunton East Lass 8th 197208 *by* Duston Delegate 18th 52719.
2804 R.N.—W. Hallas, Bank House Farm, Helsby, Warrington, for **Hallastone Premier 49th.**
H.C.—2808. C.—2810, 2818.

Class 341.—*Large White Boars, born in 1934.*

2830 I.—D. R. Daybell & Son, Bottesford, Nottingham, for **Bottesford Boy 36th** (583) born Jan. 12; *s.* Walton Boy 42nd 73357, *d.* Bottesford Buttercup 124th 188272 *by* Edmonton Bradbury 3rd 56491.
2852 II.—Alfred W. White, Hillegom, Spalding, for **Spalding Bradbury 42nd** (4011), born Jan. 2; *s.* Aldenham Bradbury 9th 70629, *d.* Caldmore Superior 25th 212122 *by* Taunton Turk 25th 66009.
2836 III.—Alfred Lewis, Panworth Hall, Ashill, Thetford, for **Westacre Bradbury 960th** (6230), born Jan. 3; *s.* Westacre Bradbury 714th 81883, *d.* Spalding Lady Mollington 53rd 225076 *by* Aldenham Bradbury 9th 70629.
2832 IV.—D. R. Daybell & Son, for **Bottesford King David 4th** (575), born Jan. 7; *s.* Histon King David 85th 80557, *d.* Bottesford Buttercup 115th 178878 *by* Edmonton Bradbury 3rd 56491.
2826 V.—Chivers & Sons, Ltd., Histon, Cambridge, for **Histon White Lion** (70), born Jan. 3; *s.* Histon Lion 81st 76848, *d.* Histon Belle 241st 213570 *by* Bourne King David 287th 55975.
2856 R.N.—J. F. Wright, Olton Farm, Solihull, for **Solihull Bellman 2nd.**
H.C.—2842. C.—2824, 2833.

Class 342.—*Large White Breeding Sows, born in or before 1932.*

2872 I., Champion[2] & Champion.[3]—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Wratting Mana 15th** 217182 (536), born Feb. 26, 1932, farrowed March 14; *s.* Wratting King David 5th 78741, *d.* Wratting Mana 8th 217168 *by* Wratting Bradbury 5th 70491.
2862 II.—Lord Daresbury, C.V.O., Walton Hall, Warrington, for **Walton Mary 27th** 197666 (2285), born Feb. 4, 1930, farrowed Feb. 20; *s.* Walton King David 55th 70223, *d.* Peakirk Mary 5th 160180 *by* Bob of Bourne 28701.

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[1] Prizes, except Fourth and Fifth, given by the National Pig Breeders' Association.
[2] Silver Challenge Cup given by the National Pig Breeders' Association for the best Large White Pig.
[3] Champion Gold Medal, or £5 cash, given by the National Pig Breeders' Association for the best Large White Sow.

2870 **III.**—WALTER W. RYMAN, Wall, Lichfield, for **Wall Maid 5th 197536 (1894)**, born April 4, 1929, farrowed Jan. 21; *s.* Bourne King David 12th 40515, *d.* Whittingham Maid 10th 182872 *by* Aldenham Victor 55687.

2863 **IV.**—LORD DARESBURY, C.V.O., for **Walton Queen Mary 44th 216376 (3214)**, born Jan. 5, 1932, farrowed Jan. 25; *s.* Taunton Turk 25th 66009, *d.* Walton Queen Mary 7th 173876 *by* Dupplin Excellence 56389.

2868 **R.N.**—J. PIERPONT MORGAN, Wall Hall, Aldenham, Watford, for **Aldenham Lady Mollington 18th.**
H.C.—2859. **C.**—2857, 2869.

Class 343.—*Large White Sows, born in* 1933, *before July* 1.

2900 **I.**—ALFRED W. WHITE, Hillegom, Spalding, for **Spalding Queen 7th (3045)**, born Jan. 9; *s.* Spalding Monitor 41st 77713, *d.* Spalding Queen 215414 *by* Histon King David 43rd 69173.

2901 **II.**—W. WHITE & SON, Pool Farm, Taunton, for **Taunton Bonetta 7th (703)**, born Jan. 18; *s.* Taunton Bradman 2nd 81369, *d.* Taunton Bonetta 4th 197198 *by* Taunton King David 3rd 62253.

2887 **III.**—J. PIERPONT MORGAN, Wall Hall, Aldenham, Watford, for **Aldenham Lady Mollington 48th (5656)**, born Jan. 12; *s.* Histon Basil 2nd 69129, *d.* Weston Lady Mollington 2nd 208428 *by* Ramsey Reality 2nd 69751.

2888 **IV.**—LESLIE K. OSMOND, Barnoldby-le-Beck, Grimsby, for **Beelsby Amy 2nd (330)**, born Feb. 22; *s.* Bourne King David 223rd 55959, *d.* Amport Amy 9th 203160 *by* Westacre Layman 9th 54017.

2883 **V.**—W. HALLAS, Bank House Farm, Helsby, Warrington, for **Hallastone Belle 27th (3125)**, born Jan. 9; *s.* Hallastone Victor 26th 65139, *d.* Hallastone Belle 17th 194782 *by* Wentworth Bradbury 29th 62597.

2889 **R.N.**—WALTER W. RYMAN, Wall, Lichfield, for **Wall Brocade.**
H.C.—2898. **C.**—2876, 2893, 2894, 2896.

Class 344.—*Large White Sows, born in* 1933, *on or after July* 1.

2913 **I. & R.N. for Champion.**[1]—W. HALLAS, Bank House Farm, Helsby, Warrington, for **Hallastone Belle 25th 3257**, born July 13; *s.* Westacre Premier 3rd 81889, *d.* Hallastone Belle 17th 194782 *by* Wentworth Bradbury 29th 62597.

2924 **II.**—WALTER W. RYMAN, Wall, Lichfield, for **Wall Champion Queen 24th (6110)**, born July 3; *s.* Tockwith Royal Prince 5th 81489, *d.* Wall Champion Queen 10th 216144 *by* Wall Jay 27th 66101.

2909 **III.**—LORD DARESBURY, C.V.O., Walton Hall, Warrington, for **Walton Queen Mary 59th (4010)**, born July 5; *s.* Walton Jay 58th 81761, *d.* Walton Queen Mary 42nd 216372 *by* Taunton Turk 25th 66009.

2931 **IV.**—COL. C. J. H. WHEATLEY, Berkswell Hall, near Coventry, for **Berkswell Queen 17th (539)**, born July 6; *s.* Walton Hercules 30th 81757, *d.* Berkswell Queen 2nd 211552 *by* Newhall Banner 72465.

2933 **V.**—W. WHITE & SON, Pool Farm, Taunton, for **Taunton East Lass 21st (820)**, born July 11; *s.* Fen Bradbury 10th 60773, *d.* Taunton East Lass 8th 197208 *by* Duston Delegate 18th 52719.

2917 **R.N.**—ALFRED LEWIS, Panworth Hall, Ashill, Thetford, for **Westacre Surprise 154th.**
H.C.—2914. **C.**—2906, 2932.

Class 345.—*Large White Sows, born in* 1934.

2963 **I.**—ALFRED W. WHITE, Hillegom, Spalding, for **Spalding Superior 47th (4016)**, born Jan. 2; *s.* Aldenham Bradbury 9th 70629, *d.* Caldmore Superior 25th 212122 *by* Taunton Turk 25th 66009.

2937 **II.**—MR. & MRS. S. T. BRUNT, The Manor House, Bexley, Kent, for **Crayvalley Echo (537)**, born Jan. 14; *s.* Wall Achilles 81583, *d.* Edmonton Matchless 101st 204662 *by* Edmonton King David 196th 68740.

2960 **III.**—E. THOMLINSON, Hall Farm, Hutton Wandesley, Marston, York, for **Tockwith Blackberry 73rd (4263)**, born Jan. 14; *s.* Histon Basil 6th 84389, *d.* Tockwith Blackberry 65th *by* Walton Boy 66th 78147.

2946 **IV.**—ERNEST HARDING, Packwood Grange, Dorridge, Birmingham, for **Packwood Queen Anne 8th (4600)**, born Jan. 2; *s.* Packwood Recorder 6th 85077, *d.* Wall Queen Anne 2nd 191730 *by* Wall Jay 14th 62425.

2944 **V.**—LORD DARESBURY, C.V.O., Walton Hall, Warrington, for **Walton Primrose 117th (4235)**, born Jan. 2; *s.* Walton Jay 58th 81761, *d.* Walton Primrose 99th 216854 *by* Taunton Turk 25th 66009.

2942 **R.N.**—A. H. COOPER, Lower Farm, Drointon, Stafford, for **Blithfield Marigold 10th.**
H.C.—2948. **C.**—2943, 2956.

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[1] Champion Gold Medal, or £5 cash, given by the National Pig Breeders' Association for the best Large White Sow.

Middle Whites.

Class 346.—*Middle White Boars, born in or before* 1932.

2970 **I., Champion [1] & Champion.[2]**—CHIVERS & SONS, LTD., Histon, Cambridge, for **Histon Marmion 6th** 79067 (142), born July 27, 1931; *s.* Fordon Marmion 74061, *d.* Histon Rosebud 43rd 186808 *by* Hammonds Herald 44353.

2975 **II.**—LADY H. ROGER, Yockley House, Camberley, Surrey, for **Yockley Ranger 7th** 82709 (218), born July 2, 1932; *s.* Amport Ranger 3rd 73907, *d.* Yockley Rose 178114 *by* Mistley Karim 59243.

2969 **III.**—CHIVERS & SONS, LTD., for **Histon Bold Boy 6th** 82401 (212), born Jan. 1, 1932; *s.* Shawlands Bold Boy 67965, *d.* Histon Rosadora 61st 175902 *by* Bookham Durbar 54229.

2968 **R.N.**—W. W. BUCKLE, Old Lane Farm, Colton, Tadcaster, for **Fulford Clink.**

H.C.—2967, 2971, 2973. **C.**—2972.

2970, 2980, 3015, 3033 **Special I.[3]**—CHIVERS & SONS, LTD., for **Histon Marmion 6th, Histon Marmion 23rd, Histon Woodlands 32nd and Histon Woodlands 35th.**

2988, 3002, 3061, 3080 **Special II.[3]**—CAPT. D. P. LITHGOW, for **Newton Nero, Newton Neptune 3rd, Newton Princess 9th and Newton Princess 11th.**

2978, 3014, 3032, 3053 **R.N. for Specials.[3]**—FRANKLIN BATCHELOR, for **Cooling Baron 9th, Cooling Rosa 10th Cooling Garland 26th and Cooling Helah 4th.**

Class 347.—*Middle White Boars, born in* 1933, *before July* 1.

2980 **I. & R.N. for Champion.[1]**—CHIVERS & SONS, LTD., Histon, Cambridge, for **Histon Marmion 23rd** (526), born March 17; *s.* Histon Marmion 6th 79067, *d.* Histon Dorothy 9th 218102 *by* Hammonds Handsome 2nd 74911.

2981 **II.**—MRS. HAYES SADLER, Charlton Abbotts, Andoversford, Glos., for **Norsbury Gog** 82553 (4015), born Feb. 19; *s.* Burford Goliath 73983, *d.* Norsbury Wardmaid 202268 *by* Norsbury Hivite 7th 74349.

2982 **III.**—FRANK SAINSBURY, Blunts Hall, Little Wratting, Haverhill, for **Wratting Sultan 2nd** (711), born April 8; *s.* Laybrook Sultan 2nd 74275, *d.* Compton Patty 3rd 186288 *by* Salts Baron 63761.

2978 **R.N.**—FRANKLIN BATCHELOR, Cooling Court Farm, Cooling, Rochester, for **Cooling Baron 9th.**

H.C.—2977.

Class 348.—*Middle White Boars, born in* 1933, *on or after July* 1.[4]

2988 **I.**—CAPT. D. P. LITHGOW, South Newington Manor, Banbury, for **Newton Nero** (433), born July 8; *s.* Pendley Deliverance 7th 74389, *d.* Steepness Nightingale 2nd 200572 *by* Compton Khan 66711.

2991 **II.**—MRS. HAYES SADLER, Charlton Abbotts, Andoversford, Glos., for **Woodhatch Goliath** (486), born July 14, bred by the Reigate Corporation; *s.* Burford Goliath 73983, *d.* Norsbury Vamp 2nd 200072 *by* Compton Chieftain 66705.

2993 **III.**—FRANK SAINSBURY, Blunts Hall, Little Wratting, Haverhill, for **Wratting Sultan's Lad** (759), born July 24; *s.* Laybrook Sultan's Lad 75045, *d.* Wratting Choice 6th 218910 *by* Histon Apollo 66839.

2986 **IV.**—JOHN R. HORNE-PAYNE, Crownfields, Kelvedon Hatch, Brentwood, for **Crownfields Bold Boy 2nd** (222), born July 29; *s.* Histon Bold Boy 2nd 79043, *d.* Mistley Prosperity 210356 *by* Mistley Knight 74331.

2985 **R.N.**—T. H. GLADSTONE, Eastcote Grange, Hampton-in-Arden, for **Barston Bold Boy.**

H.C.—2984, 2992, 2994.

Class 349.—*Middle White Boars, born in* 1934.

3002 **I.**—CAPT. D. P. LITHGOW, South Newington Manor, Banbury, for **Newton Neptune 3rd** (532), born Jan. 3; *s.* Newton Rebel 79159, *d.* Steepness Choice 2nd 200568 *by* Salts Baron 63761.

2996 **II.**—W. W. BUCKLE, Old Lane Farm, Colton, Tadcaster, for **Colton De Reske** (252), born Jan. 12; *s.* Wiggenhall Clinker Boy 82675, *d.* Colton Dora 217590 *by* Wiggenhall Expectation 3rd 75377.

3003 **III.**—LESLIE K. OSMOND, Barnoldby-le-Beck, Grimsby, **Beelsby Jamieson 7th** (1007), born Jan. 9; *s.* Amport Jamieson 3rd 67401, *d.* Salts Helah 14th 177278 *by* Wharncliffe Prince 32625.

2998 **IV.**—JOSEPH S. HICKS, Fordon, Wold Newton, Driffield, for **Fordon Colin** (1), born Jan. 2; *s.* Fordon Dandy 3rd 78969, *d.* Fordon Constance 3rd 209656 *by* Fulford Reliable 74087.

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[1] Champion Gold Medal, or £5 cash, given by the National Pig Breeders' Association for the best Middle White Boar.

[2] Silver Challenge Cup given by the National Pig Breeders' Association for the best Middle White Pig.

[3] Special Prizes of a Gold Medal or £5 cash (First Prize) and a Silver Gilt Medal or £2 10s. cash (Second Prize) given by the National Pig Breeders' Association for the best groups of four Pigs, bred by Exhibitor. One Boar (at least) had to be included in each group, and not more than one entry selected from any one Class.

[4] Prizes, except Fourth, given by the National Pig Breeders' Association.

3010 V.—WATFORD CORPORATION, Holywell Farm, Watford, for **Watford Ian 2nd** (958), born Jan. 20; *s.* Pendley John 74408, *d.* Shawlands Gracious Lady 11th 202520 *by* Shawlands Bold Boy 67965.
3005 R.N.—MRS. HAYES SADLER, Charlton Abbotts, Andoversford, Glos., for **Norsbury Hivite 17th.**
H.C.—3008. C.—2995, 2997.

Class 350.—*Middle White Breeding Sows, born in or before* 1932.

3015 I. & R.N. for Champion.[1]—CHIVERS & SONS, LTD., Histon, Cambridge, for **Histon Woodlands 32nd** 218162 (199), born Nov. 18, 1931, farrowed Jan. 1; *s.* Histon Revel 20th 74991, *d.* Ayle Woodlands 150088 *by* Peene Slasher 45849.
3028 II.—WATFORD CORPORATION, Holywell Farm, Watford, for **Shawlands Gracious Lady 11th** 202520 (834), born Jan. 6, 1931, farrowed Jan. 20, bred by Miss R. B. Babcock, Shawlands, Lingfield; *s.* Shawlands Bold Boy 67965, *d.* Hammonds Gracious 25th 186544 *by* Salts Illuminator 3rd 59458.
3023 III.—LESLIE K. OSMOND, Barnoldby-le-Beck, Grimsby, for **Pendley Princess Royal** 218602 (594), born Aug. 20, 1932, farrowed Feb. 12, bred by Sir Gomer Berry, Bart., Pendley Stock Farms, Tring; *s.* Wharfedale Wimple 68058, *d.* Pendley Princess 14th 200208 *by* Salts Deliverance 8th 55145.
3022 IV.—LESLIE K. OSMOND, for **Cooling Garland 22nd** 217600 (840), born March 14, 1932, farrowed Feb. 28, bred by Franklin Batchelor, Cooling, Rochester; *s.* Colton Vanguard 74815, *d.* Ifield Garland 184412 *by* Dartford Victor 54425.
3021 V.—CAPT. D. P. LITHGOW, South Newington Manor, Banbury, for **Newton Princess 2nd** 210490 (244), born Aug. 22, 1931, farrowed Jan. 6; *s.* Pendley Deliverance 7th 74389, *d.* Pendley Princess 3rd 184942 *by* Salts Prince 7th 63787.
3020 R.N.—JOHN R. HORNE-PAYNE, Crownfields, Kelvedon Hatch, Brentwood, for **Mistley Prosperity.**
H.C.—3013, 3014, 3016.

Class 351.—*Middle White Sows. born in* 1933, *before July* 1.

3050 I., Champion.[1] & R.N. for Champion [2]—WATFORD CORPORATION, Holywell Farm, Watford, for **Watford Gracious Lady** (762), born Feb. 6; *s.* Wiggenhall Clinker 16th 79307, *d.* Shawlands Gracious Lady 11th 202520 *by* Shawlands Bold Boy 67965.

3044 II.—MRS. HAYES SADLER, Charlton Abbotts, Andoversford, Glos., for **Norsbury Welcome 69th** 218516 (3075), born Jan. 18; *s.* Barford Goliath 78983, *d.* Norsbury Welcome 46th 200090 *by* Norsbury Hivite 2nd 67815.

3032 III.—FRANKLIN BATCHELOR, Cooling Court Farm, Cooling, Rochester, for **Cooling Garland 26th** (1305), born April 8; *s.* Colton Vanguard 74815, *d.* Cooling Garland 17th 209548 *by* Cooling Knight 2nd 74029.

3033 IV.—CHIVERS & SONS, LTD., Histon, Cambridge, for **Histon Woodlands 35th** (455), born Jan. 5; *s.* Histon Bold Boy 2nd 79048, *d.* Histon Woodlands 32nd 218162 *by* Histon Revel 20th 74991.

3040 V.—CAPT. D. P. LITHGOW, South Newington Manor, Banbury, for **Newton Princess 8th** (242), born Jan. 5; *s.* Newton Rebel 79159, *d.* Newton Princess 2nd 210490 *by* Pendley Deliverance 7th 74389.

3045 R.N.—MRS. HAYES SADLER, for **Norsbury Welcome 74th.**
H.C.—3038, 3041, 3042.

Class 352.—*Middle White Sows, born in* 1933, *on or after July* 1.

3061 I.—CAPT. D. P. LITHGOW, South Newington Manor, Banbury, for **Newton Princess 9th** (412), born July 4; *s.* Newton Deliverance 3rd 82521, *d.* Pendley Princess 3rd 184942 *by* Salts Prince 7th 63787.
3068 II.—FRANK SAINSBURY, Blunts Hall, Little Wratting, Haverhill, for **Wratting Choice 9th** (762), born July 24; *s.* Laybrook Sultan's Lad 75045, *d.* Wratting Choice 6th 218910 *by* Histon Apollo 66889.
3058 III.—FRANKLIN BATCHELOR, Cooling Court Farm, Cooling, Rochester, for **Cooling Helah 4th** (1491), born Aug. 28; *s.* Colton Vanguard 74815, *d.* Cooling Helah 209552 *by* Amport Illuminator 10th 74677.
3069 IV.—FRANK SAINSBURY, for **Wratting Choice 10th** (763), born July 24; *s.* Laybrook Sultan's Lad 75045, *d.* Wratting Choice 6th 218910 *by* Histon Apollo 66889.
3055 V.—CHIVERS & SONS, LTD., Histon, Cambridge, for **Histon Rosebud 52nd** (561), born July 6; *s* Fordon Marmion 74061, *d.* Histon Rosebud 43rd 186808 *by* Hammonds Herald 44353.
3062 R.N.—LESLIE K. OSMOND, Barnoldby-le-Beck, Grimsby, for **Beelsby Garland.**
H.C.—3057, 3060, 3072. C.—3051, 3066.

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[1] Champion Gold Medal, or £5 cash, given by the National Pig Breeders' Association for the best Middle White Sow.
[2] Silver Challenge Cup given by the National Pig Breeders' Association for the best Middle White Pig.

Class 353.—*Middle White Sows, born in* 1934.

3080 I.—CAPT. D. P. LITHGOW, South Newington Manor, Banbury, for **Newton Princess 11th** (585), born Jan. 6; *s.* Newton Rebel 4th 82541, *d.* Newton Princess 2nd 210490 *by* Pendley Deliverance 7th 74389.
3076 II.—JOSEPH S. HICKS, Fordon, Wold Newton, Driffield, for **Fordon Columbine** (9), born Jan. 2; *s.* Fordon Dandy 3rd 73969, *d.* Fordon Constance 3rd 209656 *by* Fulford Reliable 74087.
3085 III.—JOSEPH TRIFFITT, Fulford, York, for **Fulford Buttercup** (274), born Jan. 6; *s.* Colton Deliverance, *d.* Fulford Pansy *by* Fulford Deliverance 3rd 74861.
3081 IV.—LESLIE K. OSMOND, Barnoldby-le-Beck, Grimsby, for **Beelsby Helah 6th** (1010), born Jan. 9; *s.* Amport Jamieson 3rd 67401, *d.* Salts Helah 14th 177278 *by* Wharncliffe Prince 32625.
3087 V.—WATFORD CORPORATION, Holywell Farm, Watford, for **Watford Gracious Lady 2nd** (954), born Jan. 20; *s.* Pendley John 74408, *d.* Shawlands Gracious Lady 11th 202520 *by* Shawlands Bold Boy 67965.
3075 R.N.—CHIVERS & SONS, LTD., Histon, Cambridge, for **Histon Woodlands 34th.**
H.C.—3074, 3082, 3086. C.—3073, 3079, 3084.

Tamworths.

Class 354.—*Tamworth Boars, born in or before* 1932.

3090 I., Champion[1] & Champion.[2]—COL. C. J. H. WHEATLEY, Berkswell Hall, near Coventry, for **Berkswell Up to Date 5th** 82191 (648), born Jan. 6, 1932; *s.* Wall Up to Date 73887, *d.* Peartown Golden Slumbers 3rd 183256 *by* Leighton William 24858.
3089 II.—J. ALBERT FROST, New Hall Farm, Sutton Coldfield, for **Coldfield Maurice** 82213 (76), born Feb. 6, 1932; *s.* Coldfield Monty 82215, *d.* Coldfield Nancy 209228 *by* Coldfield Nicholas 72885.
3088 III.—MRS. CARLETON COWPER, Eamont, Penrith, for **Berkswell Luck 2nd** 86593 (811), born Oct. 20, 1932, bred by Col C. J. H. Wheatley, Berkswell Hall, near Coventry; *s.* Milton Luck 3rd 78861, *d.* Berkswell Francis 192408 *by* Berkswell Red Glove 64151.

Class 355.—*Tamworth Boars, born in* 1933.[3]

3094 I.—COL. C. J. H. WHEATLEY, Berkswell Hall, near Coventry, for **Berkswell Up to Date 11th** (889), born Feb. 4; *s.* Wall Up to Date 73887, *d.* Peartown Golden Slumbers 3rd 183256 *by* Leighton William 28458.
3093 II.—J. ALBERT FROST, New Hall Farm, Sutton Coldfield, for **Coldfield Miller** (86615 (105), born May 23; *s.* Berkswell Up to Date 4th 78813, *d.* Coldfield Myra 217344 *by* Coldfield Mike 70575.
3095 III.—T. R. WILSON, Victoria House, Rufforth, York, for **Rufforth Model Boy** 86631 (151), born Jan. 15; *s.* Whittingham Dude 3rd 78871, *d.* Berkswell Red Cap 4th 192428 *by* Basildon Tommy Kirnam 10th 64139.
3092 R.N.—W. A. BINDLEY, Woodbourne, Augustus Road, Edgbaston, for **Pamington Bobbie 8th.**

Class 356.—*Tamworth Boars, born in* 1934.

3102 I. & R.N. for Champion.[1]—T. R. WILSON, Victoria House, Rufforth, York, for **Rufforth Gold Getter** (200), born Jan. 20; *s.* Wall Gold Getter 82247, *d.* Burnham Sea Urchin 2nd 217840 *by* Milton Prince 2nd 66503.
3097 II.—E. CLIFTON-BROWN, Burnham Grove, Burnham, Bucks., for **Burnham Peter** (849), born Jan. 3; *s.* Berkswell Peter 3rd 82187, *d.* Burnham Dory Maid 217806 *by* Milton Prince 2nd 66503.
3099 III.—MRS. CARLETON COWPER, Eamont, Penrith, for **Eamont Bounty** (3), born Jan. 1; *s.* Berkswell Luck 2nd 86593, *d.* Berkswell Verna 2nd 227360 *by* Wall Up to Date 73887.
3101 R.N.—COL. C. J. H. WHEATLEY, Berkswell Hall, near Coventry, for **Berkswell Budget.**
H.C.—3096, 3098. C.—3100.

Class 357.—*Tamworth Breeding Sows, born in or before* 1932.

3109 I. & R.N. for Champion.[4]—WALTER W. RYMAN, Wall, Lichfield, for **Burnham Sailor's Lass 2nd** 198406 (32), born Jan. 23, 1930, farrowed Jan. 21, bred by E. Clifton-Brown, Burnham Grove, Burnham, Bucks.; *s.* Milton Prince 2nd 66503, *d.* Milton Sandy Lass 183250 *by* Darfield Joe 59859.

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[1] Champion Silver Gilt Medal, or £2 10*s*. in cash, given by the National Pig Breeders' Association for the best Tamworth Boar.
[2] Silver Challenge Cup given through the National Pig Breeders' Association for the best Tamworth Pig.
[3] Prizes given by the National Pig Breeders' Association.
[4] Champion Silver Gilt Medal, or £2 10*s*. in cash, given by the National Pig Breeders' Association for the best Tamworth Sow.

3104 II.—W. A. BINDLEY, Woodbourne, Augustus Road, Edgbaston, for **Pamington Red Cap** 217894 (52), born March 7, 1932, farrowed Jan. 2; *s.* Milton Luck 3rd 78861, *d.* Berkswell Red Cap 7th 209206 *by* Verzons Michael 66529.

3107 III.—MRS. CARLETON COWPER, Eamont, Penrith, for **Berkswell Slumbers 3rd** 217290 (488), born May 12, 1931, farrowed May 4, bred by Col. C. J. H. Wheatley, Berkswell Hall, near Coventry; *s.* Dollar Bobbie 73777, *d.* Peartown Golden Slumbers 183256 *by* Leighton William 28453.

3106 R.N.—E. CLIFTON-BROWN, Burnham Grove, Burnham Bucks., for **Burnham Mermaid.**

H.C.—3105. **C.**—3110.

358.—*Tamworth Sows, born in* 1933.

3114 **I., Champion**[1] **& R.N. for Champion.**[2]—COL. C. J. H. WHEATLEY, Berkswell Hall, near Coventry, for **Berkswell Rose 6th** 227842 (835), born Jan. 30; *s.* Berkswell Peter 3rd 82187, *d.* Berkswell Rose 4th 217282 *by* Dollar Bobbie 73777.

3115 II.—T. R. WILSON, Victoria House, Rufforth, York, for **Rufforth Brilliant Girl 5th** 227424 (145), born Jan. 2; *s.* Whittingham Dude 3rd 78871, *d.* Rufforth Brilliant Girl 2nd 209290 *by* Rufforth Bonny Boy 73865.

3112 III.—MRS. CARLETON COWPER, Eamont, Penrith, for **Berkswell Rose 8th** 227840 (834), born Jan. 30, bred by Col. C. J. H. Wheatley, Berkswell Hall, near Coventry; *s.* Berkswell Peter 3rd 82187, *d.* Berkswell Rose 4th 217282 *by* Dollar Bobbie 73777.

3113 R.N.—COL. C. J. H. WHEATLEY, for **Berkswell Rose 5th.**

H.C.—3111.

Class 359.—*Tamworth Sows, born in* 1934.

3122 I.—T. R. WILSON, Victoria House, Rufforth, York, for **Rufforth Brilliant Lass** (210), born Jan. 22; *s.* Wall Gold Getter 82247, *d.* Rufforth Brilliant Girl 2nd 209290 *by* Rufforth Bonny Boy 73865.

3117 II.—MRS. CARLETON COWPER, Eamont, Penrith, for **Eamont Beauriete** (6), born Jan. 1; *s.* Berkswell Luck 2nd 86593, *d.* Berkswell Verna 2nd 227860 *by* Wall Up to Date 73777.

3118 III.—MRS. CARLETON COWPER, for **Eamont Brilliant** (8), born Jan. 1; *s.* Berkswell Luck 2nd 86593, *d.* Berkswell Verna 2nd 227860 *by* Wall Up to Date 73777.

3120 R.N.—COL. C. J. H. WHEATLEY, Berkswell Hall, near Coventry, for **Berkswell Slumbers 12th.**

H.C.—3119. **C.**—3116.

Berkshires.

Class 360.—*Berkshire Boars, born in or before* 1932.

3123 **I., Champion**[3] **& Champion.**[4]—S. CECIL ARMITAGE, Lenton Fields, Nottingham, for **Lenton Keystone 3rd** 3713, born Jan. 5, 1932; *s.* Bridge Keystone 1961, *d.* Lenton Grand Duchess 10938 *by* Leadenham Duke 748.

3125 II.—CHARLES R. DUNKLEY, Moorfields, Warkton, Kettering, for **Warkton Claude** 3895, born March 2, 1932; *s.* Tissington Consul 3403, *d.* Warkton Brave Betty 12294 *by* Bungays Prince 2nd 1969.

3128 III.—FRANK TOWNEND, Highfield, Moor Allerton, Leeds, for **Highfield Roy President 6th** 1638, born July 28, 1925; *s.* Highfield Royal President 2nd 339, *d.* Harewood Bridget 1258 *by* Herriard Clondyke 23100.

3124 R.N.—E. CLIFTON-BROWN, Burnham Grove, Burnham, Bucks., for **Burnham Prim Lad.**

H.C.—3127.

Class 361.—*Berkshire Boars, born in* 1933, *before July* 1.

3129 I.—E. CLIFTON-BROWN, Burnham Grove, Burnham Bucks., for **Burnham Keystone** 3823, born Jan. 30; *s.* Lenton Keystone 3551, *d.* Burnham Betty 2nd 9186 *by* Lenton Baronet 2125.

Class 362.—*Berkshire Boars, born in* 1933, *on or after July* 1.[5]

3133 **I. & R.N. for Champion.**[3]—STEPHEN D. PLAYER, Whatton Manor, near Nottingham, for **Whipling Archduke** 3897, born July 7; *s.* Lenton British Duke 2nd 3548, *d.* Swinton Hopeful Amelia 2nd 12908 *by* Highfield Roy President 6th 1638.

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[1] Champion Silver Gilt Medal, or £2 10s. in cash, given by the National Pig Breeders' Association for the best Tamworth Sow.

[2] Silver Challenge Cup given through the National Pig Breeders' Association for the best Tamworth Pig.

[3] Champion Silver Gilt Medal, or £2 10*s.* cash, given by the National Pig Breeders' Association for the best Berkshire Boar.

[4] The "Eaton" Silver Challenge Cup given through the National Pig Breeders' Association for the best Berkshire Pig.

[5] **Prizes given by the National Pig Breeders' Association.**

3130 **II. & Special.**[1]—S. CECIL ARMITAGE, Lenton Fields, Nottingham, for **Lenton Keystone 10th** 3865, born July 8; *s.* Bridge Keystone 1961, *d.* Lenton Grand Duchess 10938 *by* Leadenham Duke 748.
3132 **III.**—HARRY C. INWOOD, Chorley House, West Wycombe, for **Ridgemoor Nonsuch 2nd**, born July 10; *s.* Ridgemoor Roy Pygmalion 9th 3743, *d.* Woodhouse Prolific 4th 11440 *by* Canford Bright Boy 1859.
3131 **R.N.**—S. CECIL ARMITAGE, for **Lenton Keystone 11th.**

Class 363.—*Berkshire Boars, born in* 1934.

3137 **I. & R.N. for Special.**[1]—E. CLIFTON-BROWN, Burnham Grove, Burnham, Bucks, for **Burnham Prim Boy**, born Jan. 15; *s.* Burnham Prim Lad 3825, *d.* Manor Winifred 10962 *by* Kingstone British King 1692.
3136 **II.**—S. CECIL ARMITAGE, Lenton Fields, Nottingham, for **Lenton Black Prince 3rd**, born Jan. 19; *s.* Lenton Black Prince 3269, *d.* Lenton Grand Duchess 7th 12746 *by* Lenton British Baron 2nd 2135.
3138 **III.**—STEPHEN D. PLAYER, Whatton Manor, near Nottingham, for **Whipling Archduke 2nd**, born Jan. 11; *s.* Lenton British Duke 2nd 3548, *d.* Swinton Hopeful Amelia 2nd 12908 *by* Highfield Roy President 1638.

Class 364.—*Berkshire Breeding Sows, born in or before* 1932.

3146 **I., Champion,**[2] **& R.N. for Champion**[3]—FRANK TOWNEND, Highfield, Moor Allerton, Leeds, for **Swinton Proud Queen** 12200, born July 1, 1929, farrowed Jan. 7, bred by Major Clive Behrens, Swinton Grange, Malton; *s.* Swinton President 1135, *d.* Swinton High Queen 4th 12174 *by* Highfield Roy President 6th 1638.
3140 **II.**—E. CLIFTON-BROWN, Burnham Grove, Burnham, Bucks., for **Burnham Griqua Lass 3rd** 13146, born April 27, 1931, farrowed Jan. 27; *s.* Hammonds Petronious 2055, *d.* Burnham Griqua 3rd 11542 *by* Burnham Nutcracker 2785.
3143 **III.**—HARRY C. INWOOD, Chorley House, West Wycombe, for **Ridgemoor Prolific** 13412, born July 4, 1931, farrowed Feb. 28; Ridgemoor Pygmalion 8th 3335, *d.* Woodhouse Prolific 4th 11440 *by* Canford Bright Boy 1859.
3139 **R.N.**—S. CECIL ARMITAGE, Lenton Fields, Nottingham, for **Bridge Primrose.**
H.C.—3142, 3145.

Class 365.—*Berkshire Sows, born in* 1933, *before July* 1.

3149 **I. & R.N. for Champion.**[3]—P. H. GOLD, Foxley Cottage, Binfield, Berks, for **Foxley Lady Prue** 13764, born Jan. 8; *s.* Hillsborough Hercules 3503, *d.* Foxley Lady Juror 2nd 11714 *by* Highfield Royal Pygmalion 13th 2077.
3147 **II.**—E. CLIFTON-BROWN, Burnham Grove, Burnham, Bucks., for **Burnham Griqua Maid**, born June 23; *s.* Lenton Keystone 3551, *d.* Burnham Griqua Lass 3rd 13146 *by* Hammonds Petronious 2055.
3148 **III.**—CHARLES R. DUNKLEY, Moorfields, Warkton, Kettering, for **Geeston Haughty Baroness** 13784, born Feb. 24, bred by G. R. Close, Geeston, Ketton, Stamford; *s.* Geeston Baronet 3rd 3839, *d.* Swinton Haughty Margaret 10th 13440 *by* Highfield Royal President 22nd 2061.
3150 **R.N.**—STEPHEN D. PLAYER, Whatton Manor, near Nottingham, for **Whippling Amelia.**

Class 366.—*Berkshire Sows, born in* 1933, *on or after July* 1.

3157 **I.**—FRANK TOWNEND, Highfield, Moor Allerton, Leeds, for **Dringhouses Princess Royal**, born July 1, bred by Col. G. E. Wilkinson, Dringhouses Manor, York; *s.* Suddon Sharper 3755, *d.* Dringhouses Peggy 13256 *by* Hillsborough Boniface 2nd 2893.
3156 **II.**—HARRY C. INWOOD, Chorley House, West Wycombe, for **Ridgemoor Prolific 4th**, born July 10; *s.* Ridgemoor Roy Pygmalion 9th 3743, *d.* Woodhouse Prolific 4th 11440 *by* Canford Bright Boy 1859.
3154 **III.**—E. R. BULL, Ringstead, Kettering, for **Ringstead Dorothy 2nd**, born July 5; *s.* Lenton Keystone 5th 3715, *d.* Ringstead Bettina 2nd 13424 *by* Syerston Baronet 3389.
3153 **R.N. & Special.**[4]—S. CECIL ARMITAGE, Lenton Fields, Nottingham, for **Lenton Grand Duchess 14th** 13840, born July 8; *s.* Bridge Keystone 1961, *d.* Lenton Grand Duchess 10938 *by* Leadenham Duke 748.
H.C.—3152, 3155.

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[1] Special Prize of £2 10*s.* given by the National Pig Breeders' Association for the best Boar in Classes 361 to 363, whose Dam has qualified for registration in the Association's Advance Register of Fecundity.
[2] The "Eaton" Silver Challenge Cup given through the National Pig Breeders' Association for the best Berkshire Pig.
[3] Champion Silver Gilt Medal, or £2 10*s.* cash, given by the National Pig Breeders' Association for the best Berkshire Sow.
[4] Special Prize of £2 10*s.* given by the National Pig Breeders' Association for the best Sow in Classes 365 to 367, whose dam has qualified for registration in the Association's Advance Register of Fecundity.

Class 367.—*Berkshire Sows, born in* 1934.

3158 I.—S. Cecil Armitage, Lenton Fields, Nottingham, for **Lenton Grand Duchess 17th**, born Jan. 19; *s.* Lenton Black Prince 8269, *d.* Lenton Grand Duchess 7th 12746 *by* Lenton British Baron 2nd 2135.

3163 II.—Frank Townend, Highfield, Moor Allerton, Leeds, for **Dringhouses Princess Royal 3rd**, born Jan. 24, bred by Col. G. E. Wilkinson, Dringhouses Manor, York; *s.* Suddon Sharper 3755, *d.* Dringhouses Excelsa 13250 *by* Swinton John 2643.

3160 III. & R.N. for Special.[1]—E. Clifton-Brown, Burnham Grove, Burnham, Bucks., for **Burnham Winifred Girl**, born Jan. 15; *s.* Burnham Prim Lad 3825, *d.* Manor Winifred 10962 *by* Kingstone British King 1692.

3161 R.N.—Stephen D. Player, Whatton Manor, near Nottingham, for **Whipling Amelia 4th.**
H.C.—3159.

Wessex Saddlebacks.

Class 368.—*Wessex Saddleback Boars, born in or before* 1932.

3166 I. & R.N. for Champion.[2]—Douglas Vickers, Preston, Hitchin, for **Preston Sovereign 2nd 3694**, born Aug. 7, 1932; *s.* Preston Dandy 2935, *d.* Preston Strawberry 15836 *by* Chellaston Gone Away 3159.

3167 II.—Major A. R. Whittington, Yarty, Axminster, for **Yarty Choice 2nd 3601**, born Jan. 3, 1932; *s.* Chellaston Royal's Son 3449, *d.* Yarty Rita 3rd 16013 *by* Rookshill Rex 3260.

3165 III.—J. W. Roberts, Hill Farm, Shefford, Beds., for **Shefford Carlos 3727**, born April 20, 1932; *s.* Carlos of Slythehurst 3024, *d.* Gift of Evergreen 14498 *by* Slythehurst Chancellor 2794.

3164 R.N.—G. A. Cole, Sidbury Mills, Sidmouth, for **Preston Defender.**

Class 369.—*Wessex Saddleback Boars, born in* 1933.[3]

3168 I., Champion[2] & Champion.[4]—Fred W. Gentle, 33, High Street, Brandon, for **Brandon David 2nd 3737**, born Jan. 7; *s.* Brandon David 3495, *d.* Brandon Poppy 11th 16074 *by* Brandon Dunstan 3161.

3171 II.—Douglas Vickers, Preston, Hitchin, for **Clough Earl 3744**, born Feb. 22, bred by H. C. Dawson, Holbeach Clough, Holbeach; *s.* Ravensdale Earl 3620, *d.* Ravensdale Lovely 4th 16092 *by* Sandrock Bandmaster 3458.

3169 III.—F. W. Gilbert, The Manor, Chellaston, Derby, for **Chellaston Squire 4th 3733**, born Jan. 6; *s.* Preston Tomahawk 3422, *d.* Chellaston Druidess 3rd 16245 *by* Hesford Hero 1st 3168.

3170 R.N.—H. Neaverson, Scotts Farm, Glinton, Peterborough, for **Glinton Boy.**

Class 370.—*Wessex Saddleback Boars, born in* 1934.

3173 I.—H. L. Brooksbank, Sandrock, Tickhill, Yorks., for **Sandrock Frivolity 3791**, born Jan. 31; *s.* Pamber Dandy 2nd 3675, *d.* Sandrock Frivolous 7th 17029 *by* Yarty Monarch 5th 3408.

3176 II.—Fred W Gentle, 33 High Street, Brandon, for **Brandon Samson 3780**, born Jan. 3; *s.* Brandon Prior 2nd 3700, *d.* Brandon Saba 16477 *by* Preston Viceroy 2nd 3469.

3180 III.—Douglas Vickers, Preston, Hitchin, for **Preston Silver King 3rd 3787**, born Jan. 1; *s.* Preston Sovereign 2nd 3694, *d.* Preston Silver Queen 16613 *by* Godalming Masterpiece 3rd 3242.

3181 R.N.—Douglas Vickers, for **Preston Vic.**

3172 Special.[5]—H. L. Brooksbank, for **Sandrock Chief 3789**, born Jan. 22; *s.* Pamber Dandy 2nd 3675, *d.* Sandrock Gift 3rd 16280 *by* Preston Odin 3369.

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[1] Special Prize of £2 10s. given by the National Pig Breeders' Association for the best Sow in Classes 365 to 367, whose dam has qualified for registration in the Association's Advance Register of Fecundity.

[2] Champion Silver Gilt Medal, or £2 10s. cash, given by the National Pig Breeders' Association for the best Wessex Saddleback Boar.

[3] Prizes given by the National Pig Breeders' Association.

[4] Silver Challenge Cup, given by the National Pig Breeders' Association for the best Wessex Saddleback Pig.

[5] Special Prize of One Guinea given by the National Pig Breeders' Association for the best Boar in Classes 369 and 370, whose Dam has qualified for registration in the Association's Advance Register of Fecundity

Class 371.—*Wessex Saddleback Breeding Sows, born in or before* 1932.

3195 **I. & R.N. for Champion.**[1]—DOUGLAS VICKERS, Preston, Hitchin, for **Slythehurst Romantic 16154**, born July 18, 1931, farrowed Jan. 1, bred by Dr. W. H. Forshaw, Slythehurst, Ewhurst, Guildford; *s.* Slythehurst Cashier 3416, *d.* Slythehurst Romance 15661 *by* Godalming Rover 2nd 3321.

3194 **II.**—DOUGLAS VICKERS, for **Preston Vixen 16784**, born July 6, 1932, farrowed Jan. 8; *s.* Godalming Masterpiece 3rd 3242, *d.* Preston Viyella 15857 *by* Preston Dandy 2935.

3188 **III.**—FRED W. GENTLE, 33 High Street, Brandon, for **Chellaston Sally 13th 16349**, born Jan. 5, 1932, farrowed Feb. 14, bred by F. W. Gilbert, The Manor, Chellaston, Derby; *s.* Chellaston Royal's Son 3450, *d.* Chellaston Sally 10th 15826 *by* Besford Hero 1st 3168.

3192 **IV.**—H. NEAVERSON, Scotts Farm, Glinton, Peterborough, for **Sobrite Sunbeam 2nd 15983**, born May 22, 1930, farrowed April 8; *s.* Yarty Monarch 3rd 3282, *d.* Preston Sunbelle 15320 *by* Brandon Tomahawk 2nd 2879.

3185 **V.**—G. A. COLE, Sidbury Mills, Sidmouth, for **Ashill Connie 14761**, born Jan. 18, 1928, farrowed May 14, bred by Miss E. Bowles, Ashill House, Yeovil; *s.* Brandon Roger 2893, *d.* Lily of Ashill 14067 *by* Pipers Adrian 2243.

3184 **R.N.**—H. L. BROOKSBANK, Sandrock, Tickhill, Yorks., for **Sandrock Frivolous 6th.**

Class 372.—*Wessex Saddleback Sows, born in* 1933.

3202 **I., Champion,**[1] **R.N. for Champion**[2] **& Special.**[3]—J. W. ROBERTS, Hill Farm, Shefford, Beds., for **Preston Orient 2nd 17081**, born Jan. 17, bred by Douglas Vickers, Preston, Hitchin; *s.* Preston Dandy 2935, *d.* Preston Orient 15597 *by* Chellaston Gone Away 3159.

3203 **II. & R.N. for Special.**[3]—DOUGLAS VICKERS, Preston, Hitchin, for **Preston Shamrock 2nd 17131**, born April 1; *s.* Preston Dandy 2935, *d.* Preston Shamrock 15206 *by* Preston Valentine 3111.

3198 **III.**—G. A. COLE, Sidbury Mills, Sidmouth, for **Sid-Vale Gift 16821**, born Jan. 14; *s.* Sid-Vale Rover 3428, *d.* Sockhill Ena 6th 15010 *by* Chettle Ariel 2806.

3199 **R.N.**—FRED W. GENTLE, 33 High Street, Brandon, for **Glinton Sunbeam 16th.**

Class 373.—*Wessex Saddleback Sows, born in* 1934.

3211 **I.**—FRED W. GENTLE, 33 High Street, Brandon, for **Brandon Duchess 4th 17185**, born Jan. 1; *s.* Godalming Caesar 2nd 3634, *d.* Brandon Duchess 2nd 16790 *by* Brandon Dunstan 3161.

3215 **II.**—DOUGLAS VICKERS, Preston, Hitchin, for **Preston Violetta 17160**, born Jan. 9; *s.* Garth Nero 3742, *d.* Preston Violet 2nd 17098 *by* Yarty Monarch 3rd 3282.

3207 **III.**—G. A. COLE, Sidbury Mills, Sidmouth, for **Sid-Vale Novice 2nd**, born Jan. 7; *s.* Preston Defender 3477, *d.* Preston Dusky 15498 *by* Paul of Preston 3222.

3213 **R.N.**—F. W. GILBERT, The Manor, Chellaston, Derby, for **Chellaston Heiress.**

Large Blacks.

Class 374.—*Large Black Boars, born in or before* 1932.

3222 **I. & Champion.**[4]—SAVERNAKE FOREST ESTATE CO., Savernake Forest, Marlborough, for **Savernake Nigger K. 159**, born Feb. 9, 1932; *s.* Baydon Lad 4th G. 361, *d.* Savernake Nightingale 2nd G. 1488 *by* Savernake Ranger's Model C. 907.

3218 **II.**—D. W. P. GOUGH, Pakenham Manor, Bury St. Edmunds, for **Pakenham Rotation H. 303**, born Jan. 24, 1931; *s.* Tartar Anticipation F. 381, *d.* Pakenham Rosette 1st E. 1842 *by* Valley Quality C. 173.

3226 **III.**—W. W. WOOLLAND, Baydon Manor, Ramsbury, Marlborough, for **Baydon King 5th H. 289**, born May 2, 1930; *s.* Grent H.J.K. F. 487, *d.* Baydon Nightingale 72nd F. 1604 *by* Baydon Satisfied 5th E. 449.

3220 **IV.**—MRS. M. E. MANSELL, Kingston Stert, Chinnor, Oxon., for **Redmarley General G. 175**, born Feb. 14, 1930, bred by A. W. Brewer, Pleyley Green Farm, Redmarley, Glos.; *s.* Kibbear Royal Prior 4th A. 1225, *d.* Redmarley Empress 1st E. 34 *by* Valley General 2nd 25401.

3225 **R.N.**—EDWARD TOWGOOD & SONS, LTD., Mill Farm, Sawston, Cambridge, for **Armsworth Hector 2nd.**

H.C.—3217, 3219, 3224.

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[1] Champion Silver Gilt Medal, or £2 10*s*. cash, given by the National Pig Breeders' Association for the best Wessex Saddleback Sow.

[2] Silver Challenge Cup, given by the National Pig Breeders' Association for the best Wessex Saddleback Pig.

[3] Special Prize of One Guinea given by the National Pig Breeders' Association for the best Sow in Classes 372 and 373, whose Dam has qualified for registration in the Association's Advance Register of Fecundity.

[4] Silver Challenge Cup, and Gold Medal to the Breeder, given by the Large Black Pig Society, for the best Boar.

Class 375.—*Large Black Boars, born in* 1933, *before July* 1.

3230 **I. & R.N. for Champion.**[1]—D. W. P. Gough, Pakenham Manor, Bury St. Edmunds, for **Pakenham Sundial 4th** L. 193, born Jan. 17; *s.* Westpetherwin Leader 2nd E. 553, *d.* Pakenham Sunshine 2nd G. 1740 *by* Pakenham Rambler F. 433.

3229 **II.**—G. A. Goodchild, Great Yeldham Hall, Essex, for **Tartar Talisman** L. 51, born Jan. 3; *s.* Kedington None Such 3rd G. 293, *d.* Tartar Mary 4th G. 1414 *by* Kedington Broker E. 469.

3227 **III.**—F. G. Alexander, Laurels Farm, Pulham Market, Diss, for **Pakenham Rally** L. 195, born Feb. 8, bred by D. W. P. Gough, Pakenham Manor, Bury St. Edmunds; *s.* Pakenham Rotation H. 303, *d.* Pakenham Prudence 2nd E. 610 *by* Drayton Proconsul C. 985.

3234 **R.N.**—Alec J. Spinks, Meadow Farm, Northwold, Brandon, for **Tartar Mate.**
H.C.—3233.

Class 376.—*Large Black Boars, born in* 1933, *on or after July* 1.[2]

3239 **I.**—D. W. P. Gough, Pakenham Manor, Bury St. Edmunds, for **Pakenham Punch** L. 199, born July 31; *s.* Pakenham Rotation H. 303, *d.* Orchard Beverley 52nd H. 102 *by* Yam Esk 2nd F. 129.

3245 **II.**—W. W. Woolland, Baydon Manor, Ramsbury, Marlborough, for **Baydon Prince 3rd** L. 243, born Aug. 4; *s.* Baydon Finalist H. 241, *d.* Baydon Nightingale 96th K. 1168 *by* Tortworth Emperor G. 21.

3244 **III.**—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Kedington Bradnam 2nd** L. 233, born July 1; *s.* Kedington Bradnam K. 33, *d.* Thelveton Vera 14th F. 560 *by* Thelveton Hero B. 741.

3236 **IV.**—Arthur E. Fairhead, Bouchier's Hall, Messing, Kelvedon, for **Pakenham Punch 2nd** L. 201, born July 31, bred by D. W. P. Gough, Pakenham Manor, Bury St. Edmunds; *s.* Pakenham Rotation H. 303, *d.* Orchard Beverley 52nd H. 102 *by* Yam Esk 2nd F. 129.

3242 **R.N.**—Sir Edward Mann, Bart., Thelveton Hall, Diss, for **Thelveton Hero 48th.**
H.C.—3240.

Class 377.—*Large Black Boars, born in* 1934.

3263 **I.**—W. W. Woolland, Baydon Manor, Ramsbury, Marlborough, for **Baydon King 9th** M. 47, born Jan. 11; *s.* Baydon King 5th H. 239, *d.* Baydon Nightingale 92nd H. 906 *by* Baydon Chief G. 311.

3253 **II.**—D. W. P. Gough, Pakenham Manor, Bury St. Edmunds, for **Pakenham Blacksmith** M. 31, born Jan. 4; *s.* Westpetherwin Leader 2nd E. 533, *d.* Fowlmere Famous 23rd H. 530 *by* Bardolph Night Boy E. 417.

3254 **III.**—D. W. P. Gough, for **Pakenham Unique** M. 33, born Feb. 1; *s.* Pakenham Rotation H. 303, *d.* Pakenham Moonbeam 2nd E. 14 *by* Drayton Proconsul C. 985.

3255 **IV.**—T. F. James, Warren Farm, Culham, Abingdon, for **Treluckey Don John** M. 29, born Jan. 4; *s.* Valley Don 2nd H. 451, *d.* Treluckey Choice G. 864 *by* Valley Cheerio E. 511.

3252 **V.**—G. A. Goodchild, Great Yeldham Hall, Essex, for **Tartar Token** M. 29, born Jan. 15; *s.* Pencorse Enterprise L. 23, *d.* Tartar Augusta 2nd K. 1164 *by* Kedington Bounder 2nd H. 261.

3246 **R.N.**—F. G. Alexander, Laurels Farm, Pulham Market, Diss, for **Depwade Don.**
H.C.—3258.

Class 378.—*Large Black Breeding Sows, born in or before* 1932.

3277 **I. & R.N. for Champion.**[3]—W. W. Woolland, Baydon Manor, Ramsbury, Marlborough, for **Baydon Nightingale 69th** F. 1204, born Aug. 26, 1929, farrowed April 28; *s.* Baydon Prior 5th E. 381, *d.* Baydon Nightingale 52nd E. 162 *by* Valley General 2nd 25401.

3272 **II.**—Mrs. M. E. Mansell, Kingston Stert, Chinnor, Oxon., for **Aston Deddington 23rd** G. 1118, born May 17, 1930, farrowed Feb. 20; *s.* Whiteway Dauntless 3rd E. 227, *d.* Aston Deddington 18th E. 536 *by* Pednor Royal 2nd 29389.

3265 **III.**—The Earl of Dartmouth, Patshull House, near Wolverhampton, for **Patshull Susan 29th** K. 76, born Jan. 22, 1932, farrowed Jan. 4; *s.* Tinten Leader C. 842 *d.* Patshull Susan 8th E. 458 *by* Patshull Heroic B. 419.

3273 **IV.**—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Fowlmere Fancy 66th** H. 596, born April 3, 1931, farrowed Jan. 13, bred by W. C. Jackson, Fowlmere, Royston; *s.* Bardolph Night Boy E. 417, *d.* Fowlmere Fancy 6th F. 372 *by* Bassingbourn Royal 2nd B. 641.

3267 **V.**—F. W. Gilbert, The Manor, Chellaston, Derby, for **Fowlmere Famous 29th** H. 586, born April 2, 1931, farrowed March 1, bred by W. C. Jackson, Fowlmere, Royston; *s.* Bardolph Night Boy E. 417, *d.* Fowlmere Famous 3rd Fc. 352 *by* Bassingbourn Royal 2nd B. 641.

3270 **R.N.**—D. W. P. Gough, Pakenham Manor, Bury St. Edmunds, for **Treslay Belle 19th.**

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[1] Silver Challenge Cup, and Gold Medal to the Breeder, given by the Large Black Pig Society, for the best Boar.

[2] Prizes, except Fourth, given by the Large Black Pig Society.

[3] Silver Challenge Cup, and Gold Medal to the Breeder, given by the Large Black Pig Society for the best Sow.

Class 379.—*Large Black Sows, born in* 1933, *before July* 1.

3282 I. & Champion.[1]—D. W. P. Gough, Pakenham Manor, Bury St. Edmunds for **Pakenham Delight L. 686**, born Jan. 7; *s.* Pakenham Rotation H. 303, *d.* Pakenham New Moon 1st G. 2512 *by* Pakenham Rambler F. 433.

3288 II.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Kedington Caress 3rd L. 326**, born Jan. 4; *s.* Kedington Broker E 469, *d.* Docking Caress 14th E. 2446 *by* Docking Foreman D. 517.

3286 III.—Sir Edward Mann, Bart., Thelveton Hall, Diss, for **Thelveton Senora 40th** L. 72, born Jan. 7; *s.* Thelveton Hero 28th G. 531, *d.* Thelveton Senora 2nd D. 2242 *by* Bardolph Jumbo C. 817.

3281 IV.—G. A. Goodchild, Great Yeldham Hall, Essex, for **Tartar Mary 10th L. 96**, born Jan. 3; *s.* Kedington None Such 3rd G. 293, *d.* Tartar Mary 4th G. 1414 *by* Kedington Broker E. 469.

3283 V.—D. W. P. Gough, for **Pakenham Fancy 7th** L. 684, both Jan. 3; *s.* Westpetherwin Leader 2nd E. 553, *d.* Fowlmere Fancy 46th H. 518 *by* Bardolph Night Boy E. 417.

3285 R.N.—Sir Edward Mann, Bart., for **Thelveton Senora 39th.**
H.C.—3287, 3292.

Class 380.—*Large Black Sows, born in* 1933, *on or after July* 1.

3297 I.—D. W. P. Gough, Pakenham Manor, Bury St. Edmunds, for **Pakenham Memory 3rd** L. 688, born July 2; *s.* Pakenham Rotation H. 303, *d.* Pakenham Memento K. 514 *by* Yam Esk 2nd F. 129.

3293 II.—F. G. Alexander, Laurels Farm, Pulham Market, Diss, for **Depwade Rose 7th** L. 700, born July 6; *s.* Kibbear Royalist 10th F. 391, *d.* Thelveton Beatrice 7th F. 1656 *by* Thelveton Hero B. 741.

3295 III.—The Earl of Dartmouth, Patshull House, near Wolverhampton, for **Patshull Susan 38th** L. 818, born July 18; *s.* Tinten Leader C. 849, *d.* Patshull Susan 15th E. 472 *by* Patshull Heroic B. 419.

3302 IV.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Kedington Vera 2nd** L. 784, born July 1; *s.* Kedington Bradnam K. 38, *d.* Thelveton Vera 14th F. 560 *by* Thelveton Hero B. 741.

3296 V.—G. A. Goodchild, Great Yeldham Hall, Essex, for **Tartar Mary 11th** L. 822, born July 4; *s.* Kedington None Such 3rd G. 293, *d.* Tartar Mary 4th G. 1414 *by* Kedington Broker E. 469.

3301 R.N.—Alec J. Spinks, Meadow Farm, Northwold, Brandon, for **Pakenham Sunshade 9th.**
H.C.—3299.

Class 381.—*Large Black Sows, born in* 1934.

3308 I.—Harry E. Bastard, Lemail, Egloshayle, Cornwall, for **Tinten Heroine 27th** M. 30, born Jan. 3; *s.* Valley Enterprise 1st H. 263, *d.* Tinten Heroine 13th E. 54 *by* Tinten Leader C. 849.

3310 II.—The Earl of Dartmouth, Patshull House, near Wolverhampton, for **Patshull Susan 33rd** M. 20, born Jan. 4; *s.* Trewithen Leader H. 325, *d.* Patshull Susan 29th K. 76 *by* Tinten Leader C. 849.

3309 III.—Harry E. Bastard, for **Tinten Heroine 28th** M. 32, born Jan. 3; *s.* Valley Enterprise 1st H. 263, *d.* Tinten Heroine 13th E. 54 *by* Tinten Leader C. 849.

3318 IV.—G. A. Goodchild, Great Yeldham Hall, Essex, for **Tartar Augusta 5th** M. 82, born Jan. 7; *s.* Tartar Talisman L. 51, *d.* Tartar Augusta 1st K. 1162 *by* Kedington Bounder 2nd H. 261.

3323 V.—W. W. Woolland, Baydon Manor, Ramsbury, Marlborough, for **Baydon Nightingale 99th** M. 80, born Jan 11; *s.* Baydon King 5th H. 239, *d.* Baydon Nightingale 92nd H. 906 *by* Baydon Chief G. 311.

3314 R.N.—D. W. P. Gough, Pakenham Manor, Bury St. Edmunds, for **Pakenham Dawn.**
H.C.—3320.

3280, 3269, 3282 Gold Vase.[2]—D. W. P. Gough, for **Pakenham Sundial 4th, Pakenham Rosemary 3rd and Pakenham Delight.**

3226, 3277, 3278 R.N. for Gold Vase.[2]—W. W. Woolland, for **Baydon King 5th, Baydon Nightingale 69th and Cornwood Empress 1st.**

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[1] Silver Challenge Cup, and Gold Medal to the Breeder, given by the Large Black Pig Society, for the best Sow.
[2] The "Baydon" Gold Vase given through the Large Black Pig Society for the best Group consisting of one Boar from Classes 374, 375 or 376, one Breeding Sow from Class 378, and one Sow from Classes 378, 379 or 380.

Gloucestershire Old Spots.

Class 382.—*Gloucestershire Old Spots Boars, born in or before* 1932.

3326 I.—Sherriff & Sons, Lemsford, Welwyn Garden, Herts., for **Nashes Bruce 6th** 5971, born July 4, 1931; *s.* Hempstead Jim 17th 5888, *d.* Nashes Blossom 28th 2535 *by* Holmwood Wight 5657.

3327 II.—J. F. Wright, Olton Farm, Solihull, for **Solihull Boxer** 5979, born Feb. 2, 1932; *s.* Solihull Bob 5915, *d.* Solihull Josephine 12th Z. 605 *by* Holmwood Lillywhite 5th 5869.

3324 III.—Reginald H. Cole, Clapcote Farm, Grittleton, Chippenham, for **Chalfield Michael**, born March 18, 1932, bred by Major R. F. Fuller, Great Chalfield, Melksham; *s.* Beara Michael 5867, *d.* Chalfield Blossom 7th Z. 588 *by* Maiden Bradley Judge 2nd 5825.

Class 383.—*Gloucestershire Old Spots Boars, born in* 1933.[1]

3328 I. & Champion.[2]—Sherriff & Sons, Lemsford, Welwyn Garden, Herts., for **Nashes Duke 25th** 5995, born Jan. 11; *s.* Solihull Peter 5936, *d.* Nashes Duchess 51st Z. 633 *by* Pevensey Hero 1st 5820.

3329 II.—Sherriff & Sons, for **Nashes Duke 27th**, born July 2; *s.* Solihull Peter 5936, *d.* Nashes Duchess 52nd Z. 634 *by* Pevensey Hero 5820.

3330 III.—J. F. Wright, Olton Farm, Solihull, for **Solihull Bob 4th** 5990, born Jan. 20; *s.* Solihull Josephine 6th Z. 388 *by* Maiden Bradley Submarine 2nd 5720.

Class 384.—*Gloucestershire Old Spots Boars, born in* 1934.

3334 I.—Sherriff & Sons, Lemsford, Welwyn Garden, Herts., for **Nashes Duke 28th** 6015, born Jan. 5; *s.* Nashes Bruce 6th 5971, *d.* Nashes Duchess 55th Z. 749 *by* Hempstead Jim 17th 5888.

3336 II.—J. F. Wright, Olton Farm, Solihull, for **Solihull Bob 6th** 6011, born Feb. 2; *s.* Solihull Bob 5915, *d.* Solihull Josephine 12th Z. 605 *by* Holmwood Lillywhite 5th 5869.

3337 III.—J. F. Wright, for **Solihull Duke** 6014, born Feb. 21; *s.* Nashes Duke 21st 5976, *d.* Solihull Bonetta Z. 385 *by* Maiden Bradley Submarine 2nd 5720.

3335 R.N.—Sherriff & Sons, for **Nashes Duke 29th.**

Class 385.—*Gloucestershire Old Spots Breeding Sows, born in or before* 1932.

3341 I. & R.N. for Champion.[3]—Sherriff & Sons, Lemsford, Welwyn Garden, Herts., for **Nashes Duchess 55th** Z. 749, born Sept. 6, 1932, farrowed Jan. 5; *s.* Hempstead Jim 17th 5888, *d.* Nashes Duchess 49th Z. 631 *by* Hempstead Spot 5619.

3343 II.—J. F. Wright, Olton Farm, Solihull, for **Solihull Josephine 12th** Z. 605, born Aug. 26, 1930, farrowed Feb. 2; *s.* Holmwood Lillywhite 5th 5869, *d.* Solihull Josephine 9th Z. 525 *by* Solihull Buffalo 5845.

3340 III.—Sherriff & Sons, for **Nashes Duchess 51st** Z. 633, born Jan. 2, 1931, farrowed May 14; *s.* Pevensey Hero 1st 5820, *d.* Nashes Duchess 44th Z. 489 *by* Hempstead Spot 5619.

3339 R.N.—Reginald H. Cole, Clapcote Farm, Grittleton, Chippenham, for **Clapcote Monte 2nd.**

Class 386.—*Gloucestershire Old Spots Sows, born in* 1933.

3346 I., R.N. for Champion[2] & Champion.[3]—Sherriff & Sons, Lemsford, Welwyn Garden, Herts., for **Nashes Duchess 57th** Z. 811, born July 2; *s.* Solihull Peter 5936, *d.* Nashes Duchess 52nd Z. 634 *by* Pevensey Hero 5820.

3347 II.—J. F. Wright, Olton Farm, Solihull, for **Solihull Primrose 12th** Z. 818, born May 14; *s.* Beara Suspense 5973, *d.* Solihull Primrose 10th Z. 736 *by* Knowle Billy 5887

3348 III.—J. F. Wright, for **Solihull Susan 16th** Z. 763, born Jan. 22; *s.* Solihull Bob 5915, *d.* Solihull Susan 12th Z. 603 *by* Holmwood Lillywhite 5th 5869.

3345 R.N.—Sherriff & Sons, for **Nashes Blossom 31st.**

Class 387.—*Gloucestershire Old Spots Sows, born in* 1934.

3352 I.—Sherriff & Sons, Lemsford, Welwyn Garden, Herts., for **Nashes Duchess 56th** Z. 810, born Jan. 5; *s.* Nashes Bruce 6th 5971, *d.* Nashes Duchess 55th Z. 749 *by* Hempstead Jim 17th 5888.

3350 II.—P. Franklin & Sons, Colney Heath Farms, St. Albans, for **Nashes Blossom 34th** Z. 809, born Jan. 7, bred by Sherriff & Sons, Lemsford, Welwyn Garden, Herts.; *s.* Solihull Joe 5870, *d.* Nashes Blossom 28th Z. 535 *by* Holmwood Wight 5657.

3351 III.—Reginald H. Hole, Clapcote Farm, Grittleton, Chippenham, for **Clapcote Amy 2nd** Z. 800, born Jan. 20; *s.* Chalfield Michael 5980, *d.* Clapcote Amy Z. 777 *by* Ethells Earl 3rd 5928.

3353 R.N.—J. F. Wright, Olton Farm, Solihull, for **Solihull Josephine 25th.**

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[1] Prizes given by the Gloucestershire Old Spots Pig Society.

[2] Perpetual Silver Challenge Cup given through the Gloucestershire Old Spots Pig Society for the best Gloucestershire Old Spots Pig.

[3] Perpetual Silver Challenge Cup given through the Gloucestershire Old Spots Pig Society for the best Sow.

Cumberlands.

Class 388.—*Cumberland Boars, born in or before* 1933.

3356 I.—Isaac Gardhouse, Aikton House, Wigton, for **Bowston Nobleman 9412** (J.O.R.N. 1), born Jan. 18, 1931, bred by J. S. Jordan, The Granary, Kendal; *s.* Anchor Admiral 10th 8890, *d.* Wampool Nora 7980 *by* Bowston Grenadier 6373.

3355 II.—Isaac Gardhouse, for **Bowston Monarch 8945** (J.O.R.M. 4), born March 16, 1930, bred by J. S. Jordan, The Granary, Kendal; *s.* Eamont Cherub 8180, *d.* Wampool Nora 7980 *by* Bowston Grenadier 6373.

Class 389.—*Cumberland Boars, born in* 1934.[1]

3358 I.—Ralph Millner, Angerton, Kirkbride, Carlisle, for **Fairway Nobleman** (M.L.N.Q. 1), born Feb. 18; *s.* Prizet Michael 9613, *d.* Woodside Norma 9460 *by* Woodside Lion 8526.

3359 II.—Robert Wilson, Dockrayrigg, Wigton, for **Dockray Quinton** (W.D.G.Q. 1), born Feb. 11; *s.* Laverock Admiral 9479, *d.* Greenspot Nellie 9531 *by* Aikton Pride 8882.

3357 III.—Isaac Gardhouse, Aikton House, Wigton, for **Aikton House Admiral** (G.D.I.Q. 11), born March 8; *s.* Aikton House Squire 9772, *d.* Eamont Rowena 9687 *by* Lonning Nat 9464.

Class 390.—*Cumberland Breeding Sows, born in or before* 1932.

3360 I. & R.N. for Champion.[2]—Isaac Gardhouse, Aikton House, Wigton, for **Eamont Rowena 9687** (C.E.C. 07), born July 7, 1932, farrowed March 3, 1933, bred by Mrs. Carleton Cowper, Eamont, Penrith; *s.* Lonning Nat 9464, *d.* Eamont Penelope 9515 *by* Moor Ben 8999.

3361 II.—Ralph Millner, Angerton, Kirkbride, Carlisle, for **Woodside Norma 9490** (B.W.W.N. 39), born Feb. 28, 1931, farrowed Feb. 18, bred by W. Bainbridge & Sons, Woodside Farm, Temple Sowerby, Penrith; *s.* Woodside Lion 8526, *d.* Woodside Mona 9096 *by* Lonning Joker 8214.

Class 391.—*Cumberland Sows, born in* 1933.

3364 I.—Isaac Gardhouse, Aikton House, Wigton, for **Croft House Opal** (R.H.G.P. 9), born Aug. 17, bred by J. J. Reid, Croft House, Kirkhampton, Carlisle; *s.* Lonning Nat 9464, *d.* Greenspot Orange 9709 *by* Laverock Admiral 9479.

3365 II.—Ralph Millner, Angerton, Kirkbride, Carlisle, for **Fairway Pauline** (M.L.N.P. 29), born July 20; *s.* Prizet Michael 9613, *d.* Fairway Doris 9727 *by* Greenspot Monarch 9015.

3363 III.—Isaac Gardhouse, for **Aikton House Belle 3rd** (G.D.I.P. 26), born July 5; *s.* Bowston Monarch 8945, *d.* Aikton House Belle 2nd 9698 *by* Aikton Pride 8882.

Class 392.—*Cumberland Sows, born in* 1934.

3367 I. & Champion.[2]—Isaac Gardhouse, Aikton House, Wigton, for **Aikton House Kitty** (G.D.I.Q. 17), born March 8; *s.* Aikton House Squire 9772, *d.* Eamont Rowena 9687 *by* Lonning Nat 9464.

3366 II.—Isaac Gardhouse, for **Aikton House Betty** (G.D.I.Q. 16), born March 8; *s.* Aikton House Squire 9772, *d.* Eamont Rowena 9687 *by* Lonning Nat 9464.

3369 III.—Ralph Millner, Angerton, Kirkbride, Carlisle, for **Fairway Norma** (M.L.N.Q. 5), born Feb. 18; *s.* Prizet Michael 9613, *d.* Woodside Norma 9490 *by* Woodside Lion 8526.

3370 R.N.—Robert Wilson, Dockrayrigg, Wigton, for **Dockray Queenie.**

Essex.[3]

Class 393.—*Essex Boars, born in or before* 1932.

3376 I.—Tinney & Hitchcock, Church End, Rickling, Newport, Essex, for **Cressing Grand Duke 8th 3915** (529), born Jan. 12, 1931, bred by A. J. Cousins, Cressing Lodge, Braintree; *s.* Laver Peacock 3689, *d.* Cressing Grand Duchess 2nd 20362 *by* Cressing Jay 5th 3437.

3374 II.—Vincent Hills, Great Cornard, Sudbury, Suffolk, for **Thorley Sultan 4027** (582), born March 29, 1932, bred by the Exors. of J. Tinney, Thorley Hall, Bishop's Stortford; *s.* Benningtons Sultan 4th 3881, *d.* Thorley Piny 19534 *by* Rickling Angus 10th 3851.

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[1] Silver Challenge Cup given by the Cumberland Pig Breeders' Association for the best Cumberland Pig.

[2] Prizes given by the Cumberland Pig Breeders' Association.

[3] £28 towards these Prizes were given by the Essex Pig Society.

3375 **III.**—William Ritchie, Marks Hall, Margaret Roding, Dunmow, for **Roothing Sultan 3rd 3983 (563)**, born Jan. 1, 1932; *s.* Benningtons Sultan 3795, *d.* Roothing Lilac 6th 20920 *by* Rickling Duke 4th 3581.
3372 **R.N.**—F. J. Bosworth, Greens Farm, Magdalen Laver, Ongar, for **Roothing Sultan 2nd.**
3374, 3416, 3438 **Cup.**[1]—Vincent Hills, for **Thorley Sultan, Chilton Lily 10th and Chilton Rose 5th.**
3393, 3468, 3469 **R.N. for Cup.**[1]—A. J. Cousins, for **Cressing Grand Duke 24th, Cressing Grand Duchess 13th and Cressing Grand Duchess 14th.**

Class 394.—*Essex Boars, born in* 1933.

3382 **I.**—William Ritchie, Marks Hall, Margaret Roding, Dunmow, for **Cressing Grand Duke 17th 4143 (635)**, born Jan. 5, bred by A. J. Cousins, Cressing Lodge, Braintree; *s.* Laver Peacock 3689, *d.* Cressing Grand Duchess 1st 20360 *by* Cressing Jay 5th 3437.
3384 **II.**—Major A. M. Tabor, Bovingdon Hall, Braintree, for **Bocking Dictator 4163 (651)**, born Aug. 7; *s.* Chantry Casca 4049, *d.* Bocking Beauty 20930 *by* Thorley Mac 2nd 3775.
3383 **III.**—Major Sir Edward P. Stracey, Bart., Rackheath Park, Norwich, for **Rackheath Vim 4193 (666)**, born Sept. 17; *s.* Laver Judge 6th 4088, *d.* Rackheath Violet 4th 21640 *by* Rackheath Cassio 2nd 3899.
3378 **IV.**—R. N. Broad, Benningtons, Hatfield Broad Oak, Bishop's Stortford, for **Benningtons Sultan 7th 4111 (626)**, born Jan. 3; *s.* Cressing Grand Duke 5th 3387, *d.* Benningtons Limekiln 20858 *by* Starling Terrier 2338.
3379 **R.N.**—R. N. Broad, for **Benningtons Sultan 8th.**
H.C.—3380, 3385.

Class 395.—*Essex Boars, born in* 1934.

3393 **I.**—A. J. Cousins, Cressing Lodge, Braintree, for **Cressing Grand Duke 24th 4201 (670)**, born Jan. 8; *s.* Trueloves Bachelor 4101, *d.* Cressing Grand Duchess 3rd 20450 *by* Cressing Jay 5th 3437.

3388 **II.**—H. S. Ashton, Trueloves, Ingatestone, for **Trueloves Edward 4219 (679)**, born Jan. 14; *s.* Cherry of Trueloves 3679, *d.* Trueloves Madly 19518 *by* Roothing Laughter 13th 3209.

3402 **III.**—William Ritchie, Marks Hall, Margaret Roding, Dunmow, for **Roothing Grand Duke 4213 (676)**, born Jan. 17; *s.* Cressing Grand Duke 17th 4143, *d.* Roothing Lilac 13th 21270 *by* Benningtons Sultan 3795.

3389 **IV.**—F. J. Bosworth, Greens Farm, Magdalen Laver, Ongar, for **Laver Sultan 5th 4233 (690)**, born Jan. 1; *s.* Roothing Sultan 2nd 3981, *d.* Laver Cat 21272 *by* Barling Judge 3823.

3401 **V.**—Mrs. L. R. Lowe, Gosfield Hall, Halstead, for **Gosfield Scout 13th 4209 (674)**, born Jan. 14; *s.* Laver Judge 4th 4079, *d.* Gosfield Lake 50th 21608 *by* Foxton Duke 1st 3747.

3403 **R.N.**—Major A. M. Tabor, Bovingdon Hall, Braintree, for **Bocking Endeavour.**
H.C.—3387, 3404.

Class 396.—*Essex Breeding Sows, born in or before* 1932.

3416 **I.**—Vincent Hills, Great Cornard, Sudbury, Suffolk, for **Chilton Lily 10th 21168 (2546)**, born Jan. 2, 1932, farrowed Jan. 5; *s.* Bromley Emperor 3691, *d.* Chilton Lily 7th 19890 *by* Rickling Reignier 9th 2527.

3418 **II.**—Vincent Hills, for **Chilton Lily 11th 21504 (2711)**, born Jan. 2, 1932, farrowed Jan. 9; *s.* Bromley Emperor 3691, *d.* Chilton Lily 7th 19890 *by* Rickling Reignier 9th 2527.

3411 **III.**—A. Buchanan, Benton Hall, Witham, for **Laver Laura 21452 (2685)**, born July 15, 1932, farrowed Feb. 5, bred by F. J. Bosworth, Greens Farm, Magdalen Laver, Ongar; *s.* Barling Judge 3823, *d.* Laver Liveliness 19956 *by* Thorley Drummer 3409.

3423 **IV.**—William Ritchie, Marks Hall, Margaret Roding, Dunmow, for **Roothing Female 6th 19676 (1854)**, born Aug. 1, 1928, farrowed Jan. 12; *s.* Peace Kaiser 3233, *d.* Roothing Female 2nd 18718 *by* Tewes Laughter 1953.

3415 **V.**—Mrs. Frank Hilder, Huskards, Ingatestone, for **Barling Glitter Huskard, 20510 (2318)**, born Jan. 17, 1930, farrowed Jan. 9, bred by Kemsley & Kemsley Great Wakering, Essex; *s.* Roothing Laughter 17th 3537, *d.* Barling Evangeline 20160 *by* Woolmer Surprise 3195.

3425 **R.N.**—Tinney & Hitchcock, Church End, Rickling, Newport, Essex, for **Rickling Charlotte 25th.**
H.C.—3405, 3408.

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[1] The "Sedgemere" Silver Challenge Cup given through the Essex Pig Society for the best group of three Essex Pigs.

Class 397.—*Essex Sows, born in* 1933, *before July* 1,

3442 I. & Champion.[1]—WILLIAM RITCHIE, Marks Hall, Margaret Roding, Dunmow, for **Roothing Lilac 14th 21508 (2713)**, born Jan. 10; *s.* Trueloves Atom 3847, *d.* Roothing Lilac 6th 20902 *by* Rickling Duke 4th 3581.

3438 II. & R.N. for Champion.[1]—VINCENT HILLS, Great Cornard, Sudbury, Suffolk, for **Chilton Rose 5th 21500 (2709)**, born Jan. 2; *s.* Pan Robin 3903, *d.* Chilton Rose 4th 21498 *by* Bromley Emperor 3691.

3428 III.—H. S. ASHTON, Trueloves, Ingatestone, for **Trueloves Brenda 21572 (2740)** born Jan. 1; *s.* Cherry of Trueloves 3679, *d.* Trueloves Chess 20782 *by* Barling Neptune 3261.

3441 IV.—KING'S COLLEGE FARMS, Worlaby Hall, Worlaby, Brigg, Lincs., for **Elsham Concord 1st 22454 (3190)**, born Feb. 8; *s.* Lanhams Peacock 1st 4001, *d.* Tanfield Concord 20282 *by* Peace King 3231.

3437 V.—MRS. FRANK HILDER, Huskards, Ingatestone, for **Huskards Cressing Glitter 21496 (2707)**, born Jan. 1; *s.* Cressing Grand Duke 9th 3949, *d.* Barling Glitter Huskards 20510 *by* Roothing Laughter 17th 3537.

3430 R.N.—F. J. BOSWORTH, Greens Farm, Magdalen Laver, Ongar, for **Laver Classic.**

H.C.—3440, 3443.

Class 398.—*Essex Sows, born in* 1933, *on or after July* 1.

3451 I.—F. J. BOSWORTH, Greens Farm, Magdalen Laver, Ongar, for **Laver Deer 22494 (3210)**, born July 4; *s.* Roothing Sultan 2nd 3981, *d.* Laver Cat 21272 *by* Barling Judge 3823.

3454 II.—A. J. COUSINS, Cressing Lodge, Braintree, for **Cressing Grand Duchess 12th 22354 (3142)**, born July 5; *s.* Hanningfield Janitor 3965, *d.* Cressing Grand Duchess 2nd 20362 *by* Cressing Jay 5th 3437.

3448 III.—H. S. ASHTON, Trueloves, Ingatestone, for **Trueloves Babs 21980 (2953)**, born July 5; *s.* Cherry of Trueloves 3679, *d.* Trueloves Crony 20528 *by* Barling Neptune 3261.

3456 IV.—VINCENT HILLS, Great Cornard, Sudbury, Suffolk, for **Chilton Pansy 4th 22204 (3071)**, born July 19; *s.* Pan Robin 3903, *d.* Chilton Lily 10th 21186 *by* Bromley Emperor 3691.

3449 V.—H. S. ASHTON, for **Trueloves Becky 21966 (2946)**, born July 14; *s.* Laver Drummer 3659, *d.* Trueloves Daylight 17516 *by* Barling Governor 2493.

3458 R.N.—WILLIAM RITCHIE, Marks Hall, Margaret Roding, Dunmow, for **Roothing Female 19th.**

H.C.—3450, 3452.

Class 399.—*Essex Sows, born in* 1934.

3468 I.—A. J. COUSINS, Cressing Lodge, Braintree, for **Cressing Grand Duchess 13th 22356 (3143)**, born Jan. 8; *s.* Trueloves Bachelor 4101, *d.* Cressing Grand Duchess 3rd 20450 *by* Cressing Jay 5th 3437.

3469 II.—A. J. COUSINS, for **Cressing Grand Duchess 14th 22358 (3144)**, born Jan. 8; *s.* Trueloves Bachelor 4101, *d.* Cressing Grand Duchess 3rd 20550 *by* Cressing Jay 5th 3437.

3466 III.—F. J. BOSWORTH, Greens Farm, Magdalen Laver, Ongar, for **Laver Early 22490 (3208)**, born Jan. 6; *s.* Roothing Sultan 2nd 3981, *d.* Laver Cray 21202 *by* Barling Judge 3823.

3475 IV.—MRS. FRANK HILDER, Huskards, Ingatestone, for **Huskards Grand Duchess 22366 (3148)**, born Jan. 9; *s.* Cressing Grand Duke 9th 3949, *d.* Trueloves Aim 2nd 21484 *by* Tanfield King 2nd 3973.

3471 V.—CHARLES F. DAY, Potters Tye, Acton, Sudbury, Suffolk, for **Potters Bess 30th 22444 (3189)**, born Jan. 14; *s.* Thorley Sultan 4027, *d.* Potters Bess 23rd 21286 *by* Laver Drummer 3705.

3477 R.N.—VINCENT HILLS, Great Cornard, Sudbury, Suffolk, for **Chilton Duchess 12th.**

H.C.—3463, 3464, 3465.

Long White Lop-eared.

Class 400.—*Long White Lop-Eared Boars, born in or before* 1932.

3487 I., Champion[2] & R.N. for Champion.[3]—W. H. NEAL, Walreddon Farm, Tavistock for **Treringey Captain 2nd 2494**, born Jan. 24, 1932, bred by A. H. Johns & Son Treringey, Crantock; *s.* Devonshire Ladder 1880, *d.* Trethvas Duchess 4th 5941 *by* Priory Millman 10th 1586.

3485 II. & R.N. for Champion.[2]—G. H. EUSTICE, Bezurrell, Gwinear, Hayle, for **Trolvis Ben 13th 2614**, born Aug. 7, 1932, bred by Blight Bros., Trolvis, Stithians, Cornwall; *s.* Treringey Ben 2nd 2370, *d.* Trolvis Ruby 67th 6807 *by* Marridge Hill Ben 2nd 1684.

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[1] Champion Silver Cup given by the Essex Pig Society for the best Essex Pig.

[2] Champion Silver Medal given by the National Long White Lop-Eared Pig Society for the best Boar.

[3] The "Risingholme" Silver Challenge Cup given through the National Long White Lop-Eared Pig Society for the best Long White Lop-Eared Pig.

3486 III.—H. R. JASPER, East Petherwin Farm, South Petherwin, Launceston, for **Trolvis Ben 11th 2328**, born Feb. 3, 1931, bred by Blight Bros., Trolvis, Stithians; *s.* Pennarc Trigo 1864, *d.* Trolvis Ruby 50th 5969 *by* Bezurrell Ben 3rd 1606.

Class 401.—*Long White Lop-Eared Boars, born in* 1933.

3489 I.—W. J. WESTLAKE, Godwell, Ivybridge, for **Godwell Captain 2612**, born Jan. 6; *s.* Bezurrell Bacon Boy 31st 2466, *d.* Godwell Lily 6th 6715 *by* Devonshire Sportsman 2108.

3488 II.—G. H. EUSTICE, Bezurrell, Gwinear, Hayle, for **Trolvis Ben 15th 2616**, born Jan. 29, bred by Blight Bros., Trolvis, Stithians; *s.* Treringey Ben 2nd 2370, *d.* Trolvis Ruby 67th 6807 *by* Marridge Hill Ben 2nd 1684.

Class 402.—*Long White Lop-Eared Boars, born in* 1934.

3491 I.—G. H. EUSTICE, Bezurrell, Gwinear, Hayle, for **Bezurrell Quality 2714**, born Jan. 7; *s.* Trolvis Ben 15th 2616, *d.* Bezurrell Mona 23rd 7613 *by* Afton Gay Boy 1122.

3494 II.—W. J. WESTLAKE, Godwell, Ivybridge, for **Godwell Baconer 2728**, born Jan. 8; *s.* Petherwin Lad 2500, *d.* Godwell Duchess 2nd 7313 *by* Devonshire Sportsman 2108.

3490 III.—DARTINGTON HALL, LTD., Clifford Farm, Drewsteignton, Exeter, for **Clifford Defiance 2708**, born Jan. 20; *s.* Priory Soloman 2532, *d.* Clifford Bashful 7171 *by* Ipplepen Hopeful 2106.

3493 R.N.—W. H. NEAL, Walreddon Farm, Tavistock, for **Yealmpstone Gay Boy 9th.**

H.C.—3492.

Class 403.—*Long White Lop-Eared Breeding Sows, born in or before* 1932.

3497 I., Champion [1] & Champion.[2]—H. R. JASPER, East Petherwin Farm, South Petherwin Launceston, for **Trolvis Ruby 57th 6057**, born Feb. 10, 1929, farrowed Jan. 3; *s.* Bezurrell Ben 3rd 1606, *d.* Trolvis Ruby 32nd 4659 *by* Erme Hero 2nd 1058.

3496 II.—G. H. EUSTICE, Bezurrell, Gwinear, Hayle, for **Bezurrell Alacrity 16th 6745**, born Jan. 3, 1931, farrowed Jan. 15; *s.* Priory Millman 11th 2078, *d.* Bezurrell Alacrity 7th 5851 *by* Afton Gay Boy 1122.

3495 III.—DARTINGTON HALL, LTD., Clifford Farm, Drewsteignton, Exeter, for **Clifford Attraction 6769**, born Jan. 10, 1931, farrowed May 17; *s.* Ipplepen Hopeful 2106, *d.* Lidcutt Vanity 3rd 6383 *by* Lumburn Lad 5th 1732.

3499 R.N.—CAPT. D. M. WILLS, Barley Wood, Wrington, Somerset, for **Prestow Rhoda 8th.**

H.C.—3498.

Class 404.—*Long White Lop-Eared Sows, born in* 1933.[3]

3505 I. & R.N. for Champion.[2]—W. H. NEAL, Walreddon Farm, Tavistock, for **Petherwin No. 25 7601**, born March 20, bred by H. R. Jasper, East Petherwin Farm, South Petherwin, Launceston; *s.* Trolvis Ben 11th 2328, *d.* Lidcutt Vanity 6th 6761 *by* Lumburn Lad 5th 1732.

3504 II.—H. R. JASPER, East Petherwin Farm, South Petherwin, Launceston, for **Petherwin No. 13 of 1933 7401**, born Feb. 5; *s.* Trolvis Ben 11th 2328, *d.* Lidcutt Vanity 5th 6759 *by* Lumburn Lad 5th 1732.

3501 III.—DARTINGTON HALL, LTD., Clifford Farm, Drewsteignton, Exeter, for **Clifford Countess 2nd 7479**, born Jan. 8; *s.* Ipplepen Hopeful 2106, *d.* Lidcutt Vanity 3rd 6383 *by* Lumburn Lad 5th 1732.

3500 R.N.—DARTINGTON HALL, LTD., for **Clifford Countess.**

H.C.—3506.

Class 405.—*Long White Lop-Eared Sows, born in* 1934.

3507 I.—DARTINGTON HALL, LTD., Clifford Farm, Drewsteignton, Exeter, for **Clifford Dawn 7693**, born Jan. 20; *s.* Priory Soloman 2532, *d.* Clifford Bashful 7173 *by* Ipplepen Hopeful 2106.

3509 II.—G. H. EUSTICE, Bezurrell, Gwinear, Hayle, for **Bezurrell Mona 27th 7703**, born Jan. 7; *s.* Trolvis Ben 15th 2616, *d.* Bezurrell Mona 23rd 7613 *by* Afton Gay Boy 1122.

3508 III.—G. H. EUSTICE, for **Bezurrell Mona 26th 7701**, born Jan. 7; *s.* Trolvis Ben 15th 2616, *d.* Bezurrell Mona 23rd 7613 *by* Afton Gay Boy 1122.

3510 R.N.—H. R. JASPER, East Petherwin Farm, South Petherwin, Launceston, for **Petherwin No. 1 of 1934.**

H.C.—3512.

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[1] The "Risingholme" Silver Challenge Cup given through the National Long White Lop-Eared Pig Society for the best Long White Lop-Eared Pig.

[2] Champion Silver Medal given by the National Long White Lop-Eared Pig Society for the best Sow.

[3] Prizes given by the National Long White Lop-Eared Pig Society.

Welsh.

Class 406.—*Welsh Boars, born in* 1933 *or* 1934.

3514 I.—R. Ewart Owen, Tanlan Hall Home Farm, Prestatyn, for **Prestatyn Gay Boy 1st** 117 (D.U. 102), born Jan. 15, 1933; *s.* Derwen Gay Boy 64, *d.* Prestatyn Megan 1st 265 *by* Forest Pattern 17th 57.

3513 II.—Dinam Estates Co., Llandinam Hall Farms, Llandinam, Mont., for **Dinam Imperious** 181 (B.U. 759), born July 5, 1933; *s.* Dinam Horus 80, *d.* Dinam Hopeful 2nd 211 *by* Peniel Premier 1st 44.

3515 III.—T. M. Williams, Brechfa, Clynderwen, Pembrokeshire, for **Brechfa Champion** 166 (T.W. 9), born Sept. 1, 1933; *s.* Derwen Bacon Boy 120, *d.* Brechfa Lady 330 *by* Dyffryn Taf 19th 1584.

Class 407.—*Welsh Breeding Sows, born in or before* 1932.

3519 I.—R. Ewart Owen, Tanlan Hall Home Farm, Prestatyn, for **Prestatyn Lucy 5th** 181 (D.U. 5), born Jan. 2, 1931, farrowed Feb. 10; *s.* Forest Pattern 17th 57, *d.* Hedog Lucy 81 *by* Penback Cymro 34.

3518 II.—R. Ewart Owen, for **Prestatyn Lucy 4th** 180 (D.U. 4), born Jan. 2, 1931, farrowed Jan. 10; *s.* Forest Pattern 17th 57, *d.* Hedog Lucy 81 *by* Penback Cymro 34.

3516 III.—Dinam Estates Co., Llandinam Hall Farms, Llandinam, Mont., for **Dinam Glorious** 140 (B.U. 512), born July 22, 1931, farrowed Feb. 14; *s.* Penback Cymro 4th 37, *d.* Dinam Cosmea 10 *by* Dolanog Prince David 2nd 312 W.

3520 R.N.—T. M. Williams, Brechfa, Clynderwen, Pembrokeshire, for **Brechfa Lady.**

Class 408.—*Welsh Sows, born in* 1933.[1]

3523 I.—R. Ewart Owen, Tanlan Hall Home Farm, Prestatyn, for **Prestatyn Demand 6th** 419 (D.U. 158), born March 17; *s.* Derwen Gay Boy 64, *d.* Hedog Lucy 81 *by* Penback Cymro 34.

3521 II.—Dinam Estates Co., Llandinam Hall Farms, Llandinam, Mont., for **Dinam Inevitable** 486 (B.U. 882), born Sept. 3; *s.* Forest Pattern 17th 57, *d.* Dinam Felicity 2nd 212 *by* Penback Cymro 4th 37.

3522 III.—R. Ewart Owen, for **Prestatyn Demand 5th** (418 D.U. 157), born March 17 *s.* Derwen Gay Boy 64, *d.* Hedog Lucy 81 *by* Penback Cymro 34.

Class 409.—*Welsh Sows, born in* 1934.

3525 I.—R. Ewart Owen, Tanlan Hall Home Farm, Prestatyn, for **Prestatyn Molly** 477 (D.U. 8), born Jan. 10; *s.* Prestatyn Gay Boy 1st 117, *d.* Prestatyn Lucy 4th 180 *by* Forest Pattern 17th 57.

3524 II.—Dinam Estates Co., Llandinam Hall Farms, Llandinam, Mont., for **Dinam Jessamine 1st** 487 (B.U. 916), born Jan 1; *s.* Prestatyn Premier 60, *d.* Dinam Hawthorn 167.

3526 III.—R. Ewart Owen, for **Prestatyn Nancy** 478 (B.U. 7), born Jan. 10; *s.* Prestatyn Gay Boy 1st 117, *d.* Prestatyn Lucy 4th 180 *by* Forest Pattern 17th 57.

3527 R.N.—T. M. Williams, Brechfa, Clynderwen, Pembrokeshire, for **Brechfa Lily.**

Bacon Pigs.

Class 410.—*Two Bacon Pigs of any Pure Breed, not less than* 200 *lb. and not exceeding* 230 *lb. each live weight.*

3541 I. & Champion.[2]—Sir William S. Hyde Parker, Bart., Long Melford, Suffolk. (Large White.)

3529 II., 3530 Champion[3] & 3531 IV.—H. R. Davidson, Common Lane, Batford, Harpenden. (Large White.)

3534 III.—Capt. R. S. Hall, New Hall, Tendring, Clacton-on-Sea. (Large White.)

3539 R.N.—J. Pierpont Morgan, Wall Hall, Aldenham, Watford. (Large White.)

H.C.—3548, 3547.

Class 411.—*Two Bacon Pigs, First Cross between any Pure Breeds, not less than* 200 *lb. and not exceeding* 230 *lb. each live weight.*

3564 I. & R.N. for Champion.[2]—Alec J. Spinks, Northwold, Brandon. (*s.* Large White, *d.* Large Black.)

3548 II.—H. R. Davidson, Common Lane, Batford, Harpenden. (*s.* Wessex Saddleback, *d.* Large White.)

3568 III.—T. L. Ward, Cokhay, Repton, Derby. (*s.* Large White, *d.* Large Black.)

3565 IV.—George Stedman & Son, Little Stonham, Stowmarket. (*s.* Large White, *d.* Large Black.)

3561 R.N.—Mrs. A. S. Ruffell, Clipt Bushes, Cockfield. (*s.* Large White, *d.* Large Black.)

3562 R.N. for Champion.[3]—Ruffell & Kent, Stour Hill, Cockfield. (*s.* Large White, *d.* Middle White.)

H.C.—3549.

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[1] Prizes given by the Welsh Pig Society.

[2] "Orwell Works" Champion Prize of £25 given through the Ipswich Local Fund for the best Pen of Bacon Pigs.

[3] "Orwell Works" Champion Prize of £25 given through the Ipswich Local Fund for the best two carcases in the same Classes.

Porkers.

Class 412.—*Two Pigs of any Pure Breed, above* 100 *lb. and not exceeding* 140 *lb. each live weight.*

3576 I. & 3575 II.—H. R. DAVIDSON, Common Lane, Batford, Harpenden. (Large White.
3580 III.—A. E. LAW, Newborough, Peterborough. (Large White.)
3579 R.N.—ERNEST HARDING, Packwood Grange, Dorridge, Birmingham. (Large White.)

Class 413.—*Two Pigs, First Cross between any Pure Breeds, above* 100 *lb. and not exceeding* 140 *lb. each live weight.*

3598 I.—A. E. LAW, Newborough, Peterborough. *s.* Large White, *d.* Middle White.)
3601 II.—ALEC J. SPINKS, Northwold. Brandon. (*s.* Large White, *d.* Large Black.)
3595 III.—R. EWART OWEN, Tanlan Hall Home Farm, Prestatyn. (*s.* Welsh, *d.* Large White.)
3585 IV.—BRIG.-GEN. B. ATKINSON, C.B., C.M.G., Mistley Hall, Manningtree. (*s.* Large White, *d.* Middle White.)
3591 R.N.—ERNEST HARDING, Parkwood Grange, Dorridge, Birmingham (*s.* Large White, *d.* Wessex Saddleback.)
H.C.—3591, 3597.

POULTRY.

By "Cock" and "Hen" are meant birds hatched previous to January 1, 1934; and by "Cockerel" and "Pullet" are meant birds hatched in 1934.

The Prizes in each Class are as follows: First Prize, 30s.; Second Prize, 20s.; Third, Prize, 10s.; Fourth Prize, 5s.

Special Prizes were given in the Poultry Classes by the following Clubs: Croad Langshan Sussex, Columbian Wyandotte, Buff Orpington, British Black Barnevelder, British Barnevelder, Rhode Island Red, Plymouth Rock and Welsummer.
"P.F." stands for "Poultry Farm."

Class 414.—*Dorking Cocks or Cockerels.*

1 I.—JOHN A. DEWAR, Homestall P.F., East Grinstead.
5 II. & 2 R.N.—A. J. MAJOR, Ditton, Langley, Bucks.
4 III.—W. G. WATSON, Rusper Road, Horsham.
3 IV.—MRS. ARTHUR SHERSTON, Otley Hall, Ipswich.

Class 415.—*Dorking Hens or Pullets.*

10 I.—A. J. MAJOR, Ditton, Langley, Bucks.
9 II.—JOHN A. DEWAR, Homestall P.F., East Grinstead.
8 III.—JOHN WALKER, Skinners Steps, Cupar, Fife.
11 IV.—W. G. WATSON, Rusper Road, Horsham.
6 R.N.—MRS. ARTHUR SHERSTON, Otley Hall, Ipswich.

Class 416.—*Croad Langshan Cocks or Cockerels.*

12 I. & Special.—C. F. BARKER, Waverley, Brays Lane, Coventry.
14 II. & R.N. for Special.—HAROLD CHURCH, Godshill, Fordingbridge, Salisbury.
13 III.—G. T. PORRITT, 144, New Hey Road, Lindley, Huddersfield.
15 IV.—HARRY ABBOT, Premier Live Stock Farm, Reymerston, Norfolk.

Class 417.—*Croad Langshan Hens or Pullets.*

17 I. & Special.—JOSEPH BLACKBURN, Craven Nursery, Thornton-in-Craven, Skipton.
16 II. & R.N. for Special.—JOHN A. DEWAR, Homestall P.F., East Grinstead.
21 III.—HAROLD CHURCH, Godshill, Fordingbridge, Salisbury.
20 IV.—K. J. FAWCETT, 7, Hebble Gardens, Wheatley, Halifax.
18 R.N.—C. F. BARKER, Waverley, Brays Lane, Coventry.
H.C.—19.

Class 418.—*Brahma or Cochin Cocks or Cockerels.*

25 I.—H. WHITLEY, Primley, Paignton, Devon.
22 II.—JOHN A. DEWAR, Homestall P.F., East Grinstead.
23 III. & 26 IV.—THOMAS LEYSON, Forward Green, Stowmarket.
24 R.N.—MRS. A. M. HALL, The Gables, Ruyton-XI-Towns, Shropshire.

Class 420.—*Red or Brown Sussex Cocks.*

27 I. & Special, 29 III. & 31 IV.—J. Dumbleton, Sheen Croft Farm, Didcot, Berks.
30 II.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
28 R.N.—Dr. T. W. E. Royden, Fleggburgh, Norfolk.

Class 421.—*Red or Brown Sussex Hens.*

35 I. & R.N. for Special, 32 II. & 34 III.—J. Dumbleton, Sheen Croft Farm, Didcot, Berks.
33 IV.—Henry Hoadley, Little Park Hill Farm, Burwash Weald, Sussex.

Class 423.—*Red or Brown Sussex Pullets.*

37 I.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
36 II. & 38 III.—J. Dumbleton, Sheen Croft Farm, Didcot, Berks.

Class 424.—*Light Sussex Cocks.*

40 I., Special & Cup.[1]—John A. Dewar, Homestall P.F., East Grinstead.
41 II. & 43 III.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
44 IV. & 42 R.N.—J. S. Worsley, The Cottage, Old Thornaby-on-Tees.

Class 425.—*Light Sussex Hens.*

45 I. & 50 III.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
48 II.—John A. Dewar, Homestall P.F., East Grinstead.
49 IV.—Col. D. A. Chaytor, Pooley Hall, Polesworth, Tamworth.
51 R.N.—Mrs. D. M. Fairweather, Fen Farm, Hitcham, Ipswich.

Class 426.—*Light Sussex Cockerels.*

58 I., R.N. for Special & R.N. for Cup.[1]—John A. Dewar, Homestall P.F., East Grinstead.
56 II.—Col. D. A. Chaytor, Pooley Hall, Polesworth, Tamworth.
55 III.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
57 IV.—Henry Underwood, Mowshurst P.F., Edenbridge.
52 R.N.—W. J. Golding, Bowens, Penshurst, Kent.
H .C.—54.

Class 427.—*Light Sussex Pullets.*

59 I.—John A. Dewar, Homestall P.F., East Grinstead.
65 II. & 60 R.N.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
63 III.—Henry Underwood, Mowshurst P.F., Edenbridge.
62 IV.—Col. D. A. Chaytor, Pooley Hall, Polesworth, Tamworth.
H.C.—66. C.—61.

Class 428.—*Speckled Sussex Cocks.*

70 I. & Special, 72 IV. & 68 R.N.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
67 II.—Capt. the Hon. C. K. Greenway, Stanbridge Earls P.F., Romsey, Hants.
71 III.—Mrs. F. M. Heathfield, The Vale P.F., Plungar, Nottingham.
H.C.—69.

Class 429.—*Speckled Sussex Hens.*

75 I.—Sir Herbert Sharp, Bart., Morley P.F., Hasketon, Woodbridge.
76 II. & 74 III.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
77 IV.—Mrs. F. M. Heathfield, The Vale P.F., Plungar, Nottingham.
73 R.N.—Capt. the Hon. C. K. Greenway, Stanbridge Earls P.F., Romsey, Hants.
H.C.—78.

Class 430.—*Speckled Sussex Cockerels.*

79 I.—Mrs. F. M. Heathfield, The Vale P.F., Plungar, Nottingham.
83 II. & 80 IV.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
82 III.—Sir Herbert Sharp, Bart., Morley P.F., Hasketon, Woodbridge.

Class 431.—*Speckled Sussex Pullets.*

87 I. & R.N. for Special.—Mrs. F. M. Heathfield, The Vale P.F., Plungar, Nottingham.
88 II. & 86 IV.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
84 III.—Sir Herbert Sharp, Bart., Morley P.F., Hasketon, Woodbridge.

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[1] The "Crawshay Memorial" Cup given through the Sussex Poultry Club for the best Light Sussex.

Class 435.—*Sussex Hens or Pullets, any other colour.*

90 I. & Special & 93 IV.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
89 II. & R.N. for Special.—John A. Dewar, Homestall P.F., East Grinstead.
92 III.—Henry Underwood, Mowshurst P.F., Edenbridge.
91 R.N.—Francis J. Marston, Biddenden P.F., Biddenden, Kent.

Class 436.—*Gold or Silver Laced Wyandotte Cocks or Cockerels.*

94 I.—F. R. Maskery, 58, Saint Edward Street, Leek.
95 II.—Herbert Spensley, Oaks Farm, Menston-in-Wharfedale.
97 III.—Wm. Richardson, 40, Bootham Crescent, York.
96 IV.—William Mayer, Biddulph Park, Stoke-on-Trent.

Class 437.—*Gold or Silver Laced Wyandotte Hens or Pullets.*

98 I.—Miss E. T. Longe, Abbot's Hall, Stowmarket.
100 II.—Herbert Spensley, Oaks Farm, Menston-in-Wharfedale.
99 III.—Roger Hargreaves, Abbeydene P.F., Whalley, Lancs.
101 IV.—William Mayer, Biddulph Park, Stoke-on-Trent.

Class 438.—*Columbian Wyandotte Cocks or Cockerels.*

104 I & Cup.[1]—R. Matterface, 121, South Street, Bridport.
105 II. & 102 III.—Fred Brown, Woodside, Grimscar, Huddersfield.
103 IV.—W. A. Slocock, Goldsworth Orchard, St. John, Woking.

Class 439.—*Columbian Wyandotte Hens or Pullets.*

110 I., R.N. for Cup [1] & Spoon.[1]—R. Matterface, 121, South Street, Bridport.
109 II. & R.N. for Spoon.[1]—The Marchioness of Normanby, Mulgrave Castle, Lythe, Whitby.
107 III.—W. A. Slocock, Goldsworth Orchard, St. John, Woking.
111 IV & 108 R.N.—Fred Brown, Woodside, Grimscar, Huddersfield.
H.C.—106.

Class 440.—*Wyandotte Cocks or Cockerels, any other colour.*

117 I.—Roger Hargreaves, Abbeydene P.F., Whalley, Lancs.
113 II.—Alex. E. Argo, Bructor Farm, Inverurie.
114 III.—F. R. Maskery, 58, Saint Edward Street, Leek.
112 IV.—James Mellor, Tunstead, Wormhill, Buxton.
116 R.N.—W. H. Leeson, 91, Harnall Lane East, Coventry.
H.C.—115.

Class 441.—*Wyandotte Hens or Pullets, any other colour.*

121 I.—Roger Hargreaves, Abbeydene P.F., Whalley, Lancs.
118 II.—John Wharton, Honeycott Farm, Hawes, Yorks.
119 III.—J. H. Spurr, 103, Wellington Street, Kettering.
120 IV.—W. H. Leeson, 91, Harnall Lane East, Coventry.

Class 442.—*Buff Orpington Cocks or Cockerels.*

122 I. & Special & 124 III.—W. J. Golding, Bowens, Penshurst, Kent.
125 II. & 123 IV.—Thomas E. Halliday, 23, Florence Road, Sanderstead, Surrey.

Class 443.—*Buff Orpington Hens or Pullets.*

128 I. & R.N. for Special & 126 III.—W. J. Golding, Bowens, Penshurst, Kent.
127 II.—E. E. Garrod, Pedigree P.F., Capel St. Mary, Ipswich.
129 IV.—Thomas E. Halliday, 23, Florence Road, Sanderstead, Surrey.

Class 444.—*Black Orpington Cocks or Cockerels.*

136 I.—John Burdett, 1, Lake Bank Terrace, Wingate.
130 II.—Col. Humphrey Watts, O.B.E., Haslington Hall, Crewe.
133 III.—W. H. Cook (Orpington), Cook's P.F., Orpington, Kent.
134 IV.—G. T. Porritt, 144, New Hey Road, Lindley, Huddersfield.
137 R.N.—Fred Swindells, Diglake Dairy Farm, Buglawton, Cheshire.
H.C.—135. C.—132.

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[1] The "Goddard" Visiting Cup given by the Columbian Wyandotte Club for the best Columbian Wyandotte, and Silver Spoon for the best Columbian Wyandotte of opposite sex.

Class 445.—*Black Orpington Hens or Pullets.*

143 I. & 139 IV.—Fred Swindells, Diglake Dairy Farm, Buglawton, Cheshire.
142 II. & 138 III.—John Burdett, 1, Lake Bank Terrace, Wingate.
141 R.N.—W. H. Cook (Orpington), Cook's P.F., Orpington, Kent.

Class 446.—*Orpington Cocks or Cockerels, any other colour.*

144 I.—H. Whitley, Primley, Paignton, Devon.
147 II.—J. D. Kay, Stetchworth, Newmarket.
146 III.—W. H. Cook (Orpington), Cook's P.F., Orpington, Kent.
148 IV.—Harry Abbot, Premier Live Stock Farm, Reymerston, Norfolk.

Class 447.—*Orpington Hens or Pullets, any other colour.*

155 I. & 152 II.—J. D. Kay, Stetchworth, Newmarket.
154 III. & 150 R.N.—Tom Trigg, The Oaks, Anthill, Denmead, Cosham ,Hants.
151 IV.—W. H. Cook (Orpington), Cook's P.F., Orpington , Kent.
C.—153.

Class 448.—*Australorp Cocks or Cockerels.*

157 I. & 161 R.N.—Geoffrey F. Hazell, Red House Farm, Hinton, Darsham, Saxmundham.
156 II.—R. S. Marsden, Chatburn, Clitheroe.
160 III.—J. H. Beever, Wansford, Driffield.
158 IV.—J. E. H. Venning, Trefrank, St. Clether, Launceston.
H.C.—159.

Class 449.—*Australorp Hens or Pullets.*

163 I. & 170 IV.—Geoffrey F. Hazell, Red House Farm, Hinton, Darsham, Saxmundham.
166 II.—Mrs. A. M. Pape, Forest Lodge, P.F. Binfield, Bracknell.
165 III.—R. S. Marsden, Chatburn, Clitheroe.
168 R.N.—Herbert Beilby, Cragg's P.F., Stock Road, Billericay.
H.C.—164, 169. C.—162.

Class 450.—*British Jersey Giant Cocks or Cockerels.*

177 I. & 174 II.—W. Grubb, Lower Crabb P.F., Five Ashes, Sussex.
176 III.—Mrs. Allen, Newton Hall, Gargrave, Skipton.
172 IV.—Mrs. Ruth Hellaby, Woodlands, Holbrook, Ipswich.
171 R.N.—D. J. Insley, Hunstanton, Norfolk.
H.C.—173.

Class 451.—*British Jersey Giant Hens or Pullets.*

179 I.—Mrs. T. Barrell, Leedes Farm, Hemingstone, Ipswich.
185 II.—James Cowans, Deneville, Wooler.
183 III.—W. Grubb, Lower Crabb P.F., Five Ashes, Sussex.
181 IV.—Mrs. C. A. Gardiner, Pinetrees, Hadleigh Road, Ipswich.
187 R.N.—T. Smith, 48, Bridge Street, Chatteris, Cambs.
H.C.—178.

Class 452.—*Black Barnevelder Cocks or Cockerels.*

190 I. & Special & 192 II.—Mrs. Huntington, Wellesbourne House, Warwick.
191 III. & 189 R.N.—Walter C. Payne, The Chalet, Weston, Hitchin.
188 IV.—Tom Clough, The P.F., Gawsworth, Cheshire.

Class 453.—*Black Barnevelder Hens or Pullets.*

197 I. & Special & 194 II.—Mrs. Huntington, Wellesbourne House, Warwick
195 III.—Tom Clough, The P.F., Gawsworth, Cheshire.
193 IV.—T. Graham, Thornhill P.F., Longmarton, Westmorland.
196 R.N.—Walter C. Payne, The Chalet, Weston, Hitchin.

Class 456.—*Rhode Island Red Cocks.*

204 I. Special.—G. Exelby, 97, Poppleton Road, York
206 II. & R.N. for Special & 201 R.N.—G. H. Muzzlewhite, Redlands, Tavistock.
199 III.—W. R. Abbey & Son, Croft Farm, Hessay, York.
208 IV.—R. Wentworth-Hyde, Cuttinglye Brook, Crawley Down.
H.C.—198, 200 C.—207.

Class 457.—*Rhode Island Red Hens.*

211 I. & Special.—SIR HERBERT SHARP, Bart., Morley P.F., Hasketon, Woodbridge.
217 II.—G. H. MUZZLEWHITE, Redlands, Tavistock.
222 III.—THOMAS LEYSON, Forward Green, Stowmarket.
214 IV.—CAPT. THE HON. C. K. GREENWAY, Stanbridge Earls P.F., Romsey, Hants.
210 R.N.—JOHN DARNELL, Sunnymede, Rampton, Retford.
H.C.—215, 218, 223. C.—221.

Class 458.—*Rhode Island Red Cockerels.*

225 I.—RICHARD MOORE, Hammer House, Sutton Bridge, Wisbech.
235 II., 224 III. & 231 R.N.—SIR HERBERT SHARP, Bart., Morley P.F., Hasketon, Woodbridge.
229 IV.—CAPT. THE HON. C. K. GREENWAY, Stanbridge Earls P.F., Romsey, Hants.
H.C.—226, 233. C.—230.

Class 459.—*Rhode Island Red Pullets.*

245 I. & R.N. for Special & 250 II.—RICHARD MOORE, Hammer House, Sutton Bridge, Wisbech.
241 III & 246 R.N.—SIR HERBERT SHARP, Bart., Morley P.F., Hasketon, Woodbridge.
243 IV.—W. R. ABBEY & SON, Croft Farm, Hessay, York.
H.C.—237, 240. C.—248.

Class 460.—*Barred Plymouth Rock Cocks.*

254 I. & Special.—W. W. W. BUTT, Eastfield Farm, North Thoresby, Lincs.
255 II.—RICHARD MAJOR, Kirkby Lonsdale.
257 III.—L. DEAN, Hazelmere, New Mill, Huddersfield.
252 IV.—W. A. LANSDELL, Rock View, Church Road, Tiptree.
253 R.N.—R. GARLICK, Kirkby Lonsdale.
H.C.—251.

Class 462.—*Barred Plymouth Rock Cockerels.*

258 I. & R.N. for Special.—JOHN TAYLOR, Heath Farm, Tiptree.
259 II.—F. S. WILLIAMS, Cofton P.F., Northfield, Birmingham.
261 III.—W. W. W. BUTT, Eastfield Farm, North Thoresby, Lincs.
260 IV.—J. FAWCETT, Eldron House, Ingleton, Carnforth.

Class 463.—*Barred Plymouth Rock Pullets.*

265 I.—J. FAWCETT, Eldron House, Ingleton, Carnforth.
266 II.—W. W. W. BUTT, Eastfield Farm, North Thoresby, Lincs.
269 III.—JOHN TAYLOR, Heath Farm, Tiptree.
263 IV.—R. GARLICK, Kirkby Lonsdale.
H.C.—264, 267. C.—270.

Class 464.—*Buff Plymouth Rock Cocks or Cockerels.*

275 I. & Special.—W. W. W. BUTT, Eastfield Farm, North Thoresby, Lincs.
273 II.—BILSBOROUGH & BLAND, Park Lane P.F., Forton, Preston.
274 III.—W. J. BINES, Pedigree P.F., Capel St. Mary, Ipswich.
276 IV.—JOHN H. THORNTON, Hornby House, Cabus, Preston.
277 R.N.—JAMES D. ORR, Gargunnock, by Stirling.
H.C.—271.

Class 465.—*Buff Plymouth Rock Hens or Pullets.*

278 I. & R.N. for Special.—JOHN TAYLOR, Heath Farm, Tiptree.
279 II.—BILSBOROUGH & BLAND, Park Lane P.F., Forton, Preston.
280 III.—THOMAS ATKINSON, Croft P.F., Burton-in-Lonsdale, Carnforth.
282 IV.—ANDREW SOUTHERIN, 88, Burnley Road, Padiham.
283 R.N.—JAMES D. ORR, Gargunnock, by Stirling.

Class 466.—*Plymouth Rock Cocks or Cockerels, any other colour.*

288 I. & Special.—CAPT. E. DUCKWORTH, Tinsley Green, Crawley.
287 II.—W. W. W. BUTT, Eastfield Farm, North Thoresby, Lincs.
284 III.—W. R. ABBEY & SON, Croft Farm, Hessay, York.
286 IV.—C. H. DENT, Park Avenue, Windermere.
289 R.N.—CHARLES STRACEY, Cherry Chase, Tiptree.
H.C.—285.

Class 467.—*Plymouth Rock Hens or Pullets, any other colour.*

290 I. & R.N. for Special.—JOHN WHARTON, Honeycott Farm, Hawes, Yorks.
294 II.—C. H. DENT, Park Avenue, Windermere.
293 III.—W. R. ABBEY & SON, Croft Farm, Hessay, York.
292 IV.—JOHN TAYLOR, Heath Farm, Tiptree.
295 R.N.—W. W. W. BUTT, Eastfield Farm, North Thoresby, Lincs.
H.C.—291.

Class 468.—*Old English Game Black-Red Cocks or Cockerels.*

300 I.—JOHN A. DEWAR, Homestall P.F., East Grinstead.
304 II.—H. HOUGH-WATSON, Braystones House, Beckermet.
299 III.—R. S. MARSDEN, Chatburn, Clitheroe.
301 IV.—J. H. BAKER & SON, Windyash, Barnstaple.
297 R.N.—CAPT. C. W. WILSON, Kirkland House, Wigton.
H.C.—298. C.—303.

Class 469.—*Old English Game Clay or Wheaten Hens or Pullets.*

306 I.—CAPT. C. W. WILSON, Kirkland House, Wigton.
308 II.—H. HOUGH-WATSON, Braystones House, Beckermet.
305 III.—R. S. MARSDEN, Chatburn, Clitheroe.
307 IV.—J. H. BAKER & SON, Windyash, Barnstaple.

Class 470.—*Old English Game Cocks or Cockerels, any other colour.*

316 I.—H. WHITLEY, Primley, Paignton, Devon.
310 II.—R. S. MARSDEN, Chatburn, Clitheroe.
318 III.—J. H. BAKER & SON, Windyash, Barnstaple.
315 IV.—A. SLATER, The Old Vicarage, Lythe, Whitby.
313 R.N.—A. J. MAJOR, Ditton, Langley, Bucks.
H.C.—312. C.—314.

Class 471.—*Old English Game Hens or Pullets, any other colour.*

322 I.—J. H. BAKER & SON, Windyash, Barnstaple.
319 II.—CAPT. C. W. WILSON, Kirkland House, Wigton.
320 III.—ED. P. HUGHES, Crumpwell, Oswestry.
323 IV.—H. WHITLEY, Primley, Paignton, Devon.
321 R.N.—A. SLATER, The Old Vicarage, Lythe, Whitby.
H.C.—324. C.—325.

Class 472.—*Indian Game Cocks or Cockerels.*

329 I. & 332 R.N.—MRS. A. M. ORMOND, Little Copped Hall, Epping.
330 II.—W. E. PLATTEN, Hill Farm, Little Ryburgh, Fakenham.
327 III.—JOHN A. DEWAR, Homestall P.F., East Grinstead.
328 IV.—CECIL BRENT, Clampit, Callington, Cornwall.

Class 473.—*Indian Game Hens or Pullets.*

337 I.—W. E. PLATTEN, Hill Farm, Little Ryburgh. Fakenham.
335 II.—MRS. A. M. ORMOND, Little Copped Hall, Epping.
336 III.—J. H. BAKER & SON, Windyash, Barnstaple.
338 IV.—CECIL BRENT, Clampit, Callington, Cornwall.

Class 474.—*Faverolles Cocks or Cockerels.*

346 I.—MRS. HUNTINGTON, Wellesbourne House, Warwick.
342 II.—MRS. H. A. CLIVE, The Hill House, Hartpury, Gloucester.
338 III. & 347 R.N.—H. W. BIDDLECOMBE, Prestberries Farm, Hartpury, Gloucester.
348 IV.—W. W. W. BUTT, Eastfield Farm, North Thoresby, Lincs.
H.C.—343. C.—340.

Class 475.—*Faverolles Hens or Pullets.*

356 I.—C. H. BRADLEY, Tibberton, Gloucester.
354 II.—W. W. W. BUTT, Eastfield Farm, North Thoresby, Lincs.
359 III.—MRS. H. A. CLIVE, The Hill House, Hartpury, Gloucester.
357 IV.—MRS. HUNTINGTON, Wellesbourne House, Warwick.
351 R.N.—H. W. BIDDLECOMBE, Prestberries Farm, Hartpury, Gloucester.
H.C.—353. C.—355.

Class 476.—*Minorca Cocks or Cockerels.*

361 I.—COL. HUMPHREY WATTS, O.B.E., Haslington Hall, Crewe.
360 II.—JOHN A. DEWAR, Homestall P.F., East Grinstead.
362 III.—S. E. PARKER, 466, Bloxwich Road, Leamore, Walsall.
363 IV.—W. J. SEWELL, Culgaith, Penrith.

Class 477.—*Minorca Hens or Pullets.*

366 I.—John A. Dewar, Homestall P.F., East Grinstead.
368 II.—S. E. Parker, 466, Bloxwich Road, Leamore, Walsall.
364 III.—G. T. Porritt, 144, New Hey Road, Lindley, Huddersfield.
367 IV.—W. J. Sewell, Culgaith, Penrith.
365 R.N.—Col. Humphrey Watts, O.B.E., Haslington Hall, Crewe.

Class 478.—*Leghorn Cocks or Cockerels.*

369 I.—John A. Dewar, Homestall P.F., East Grinstead.
372 II.—W. G. Rogers, Lynwood House, Globe Road, Romford.
370 III.—The Countess of Stradbroke, Henham Hall, Wangford, Beccles.

Class 479.—*Leghorn Hens or Pullets.*

373 I.—Col. Humphrey Watts, O.B.E., Haslington Hall, Crewe.
374 II.—John A. Dewar, Homestall P.F., East Grinstead.
376 III.—Walter Hurst, South Terrace, Glossop.
375 IV.—W. H. Leeson, 91, Harnall Lane East, Coventry.
377 R.N.—W. G. Rogers, Lynwood House, Globe Road, Romford.

Class 480.—*Ancona Cocks or Cockerels.*

382 I.—A. Rice, Wollaston, Wellingborough.
381 II.—J. H. Baker & Son, Windyash, Barnstaple.
378 III.—Andrew Southerin, 88, Burnley Road, Padiham.
383 IV.—Edward Beer, Hadleigh, Suffolk.
379 R.N.—Gerald Gill, Newingreen, Hythe, Kent.

Class 481.—*Ancona Hens or Pullets.*

384 I.—A. Bridge, Hall Hill Farm, Rawtenstall, Rossendale.
391 II.—Mrs. D. M. Fairweather, Fen Farm, Hitcham, Ipswich.
392 III.—A. Rice, Wollaston, Wellingborough.
390 IV.—J. H. Baker & Son, Windyash, Barnstaple.
386 R.N.—Andrew Southerin, 88, Burnley Road, Padiham.
H.C.—385, 389. C.—387.

Class 482.—*Redcap Cocks or Cockerels.*

395 I.—James Fox, 2, Undercliff, Bakewell.
393 II.—H. Heath, Bakewell.
394 III.—T. H. Martin, New Road, Middleton-by-Wirksworth.
396 IV.—John Fearn, Bank Top, Youlgrave, Bakewell.

Class 483.—*Redcap Hens or Pullets.*

403 I., 397 III. & 400 IV.—H. Heath, Bakewell.
399 II.—T. H. Martin, New Road, Middleton-by-Wirksworth.
401 R.N.—James Fox, 2, Undercliff, Bakewell.
H.C.—402. C.—398.

Class 484.—*White Silkie Cocks or Cockerels.*

406 I. & 408 II.—Mrs. A. M. Hall, The Gables, Ruyton-XI-Towns.
404 III.—Mrs. Humphrey Watts, Haslington Hall, Crewe.
409 IV. & 407 R.N.—Robert L. Fairley, Lahana, Barnton, Midlothian.
H.C.—405.

Class 485.—*White Silkie Hens or Pullets.*

410 I.—Mrs. Humphrey Watts, Haslington Hall, Crewe.
415 II. & 412 IV.—Robert L. Fairley, Lahana, Barnton, Midlothian.
414 III. & 411 R.N.—Mrs. A. M. Hall, The Gables, Ruyton-XI-Towns.

Class 487.—*Silkie Hens or Pullets, any other colour.*

418 I.—David Draper, 99, Boundary Road, London, N.W.8.
416 II.—Mrs. E. S. Fentiman, 186, Whitworth Road, Swindon.
420 III. & 417 R.N.—Robert L. Fairley, Lahana, Barnton, Midlothian.
419 IV.—Mrs A. M. Hall, The Gables, Ruyton-XI-Towns.

Class 488.—*Cocks, any other distinct variety, except Bantams.*

424 I.—H. Hough-Watson, Braystones House, Beckermet. Polish.
423 II.—George Firth, Read, Burnley. Modern Game.
425 III.—Joseph Pickerill, Moorside, Madeley, Crewe. Langshan.
422 IV.—Dr T W. E. Royden, Fleggburgh, Norfolk. Sumatra Game.
426 R.N.—Harry Abbot, Premier Live Stock Farm, Reymerston, Norfolk. Andalusian.
H.C.—421.

Class 489.—*Hens, any other distinct variety, except Bantams*

430 I.—George Firth, Read, Burnley. Modern Game.
432 II.—Joseph King, West Lane Mills, Keighley. Hamburg.
431 III.—H. Hough-Watson, Braystones House, Beckermet. Polish.
428 IV.—A. H. Fox-Brockbank, The Croft, Kirksanton, Millom. Welsummer.
427 R.N.—Joseph Pickerill, Moorside, Madeley, Crewe. Langshan.
H.C.—429.

Class 490.—*Cockerels, any other distinct variety, except Bantams.*

436 I.—H. Hough-Watson, Braystones House, Beckermet. Polish.
434 II.—A. J. Major, Ditton, Langley, Bucks. Scots Dumpie.

Class 492.—*White Wyandotte Utility Cocks or Cockerels.*

437 I.—John A. Dewar, Homestall P.F., East Grinstead.
438 II.—Col. Humphrey Watts, O.B.E., Haslington Hall, Crewe.
448 III.—Edmund Holt, The Limes, Pulford, Wrexham.
439 IV.—Capt. E. Duckworth, Tinsley Green, Crawley.
443 R.N.—G. Hodson, The Kerr P.F., Kerr Street, Blackley, Manchester.
H.C.—445.

Class 493.—*White Wyandotte Utility Hens or Pullets.*

450 I.—Col. Humphrey Watts, O.B.E., Haslington Hall, Crewe.
453 II.—John A. Dewar, Homestall P.F., East Grinstead.
463 III.—J. W. Spurgeon, 85, Bury Street, Stowmarket.
454 IV.—Capt. E. Duckworth, Tinsley Green, Crawley.
456 R.N.—Herbert Beilby, Craggs P.F., Stock Road, Billericay.
H.C.—449, 455, 462. C.—464.

Class 495.—*White Leghorn Utility Hens or Pullets.*

468 I.—Col. Humphrey Watts, O.B.E., Haslington Hall, Crewe.
466 II.—John A. Dewar, Homestall P.F., East Grinstead.
470 III. & 476 IV.—R. & E. Charteris, Ltd., Chobham, Surrey.
472 R.N.—B. Stimson, Crofts Place, Little Saxham, Bury St. Edmunds.
H.C.—477.

Class 496.—*Leghorn Utility Cocks or Cockerels, any other colour.*

479 I.—Lee & Drake, 32, Pyenot Terrace, Cleckheaton.
481 II.—Austen Walker, Croxton Park, Grantham.
480 III.—The Countess of Stradbroke, Henham Hall. Wangford, Beccles.
482 IV.—W. G. Rogers, Lynwood House, Globe Road, Romford.

Class 497.—*Leghorn Utility Hens or Pullets, any other colour.*

489 I.—Tees-side Farmers, Ltd., Salutation P.F., Darlington.
487 II. & 491 IV.—Walter Hurst, South Terrace, Glossop.
486 III.—Austen Walker, Croxton Park, Grantham.
483 R.N.—Col. Humphrey Watts, O.B.E., Haslington Hall, Crewe.
H.C.—484, 490.

Class 498.—*Plymouth Rock Utility Cocks or Cockerels.*

495 I.—J. Owen & Son, Stock Farm, Stock, Ingatestone.
492 II.—W. W. W. Butt, Eastfield Farm, North Thoresby, Lincs.
494 III.—John Taylor, Heath Farm, Tiptree.
493 IV.—Bilsborough & Bland, Park Lane P.F., Forton, Preston.

Class 499.—*Plymouth Rock Utility Hens or Pullets.*

498 I.—Thomas E. Howes, The Manor, Thurston, Bury St. Edmunds.
497 II.—John Taylor, Heath Farm, Tiptree.
500 III.—Bilsborough & Bland, Park Lane P.F., Forton, Preston.
496 IV.—W. W. W. Butt, Eastfield Farm, North Thoresby, Lincs.
499 R.N.—Mrs. W. G. Jacka, Ninnis, Germoe, Marazion.
H.C.—502.

Class 500.—*Sussex Utility Cocks or Cockerels.*

503 I.—John A. Dewar, Homestall P.F., East Grinstead.
505 II.—Sir Gomer Berry, Bart. Pendley Stock Farms, Tring.
510 III.—Col. Humphrey Watts, O.B.E., Haslington Hall, Crewe.
508 IV.—Col. D. A. Chaytor, Pooley Hall, Polesworth, Tamworth.
507 R.N.—J. Dumbleton, Sheen Croft Farm, Didcot, Berks.
H.C.—509. C.—511.

Class 501.—*Sussex Utility Hens or Pullets.*

516 I.—John A. Dewar, Homestall P.F., East Grinstead.
514 II.—Sir Herbert Sharp, Bart., Morley P.F., Hasketon, Woodbridge.
513 III.—Col. D. A. Chaytor, Pooley Hall, Polesworth, Tamworth.
524 IV.—Mrs. F. D. Crow, Beeswing P.F., Little Cornard, Sudbury, Suffolk.
519 R.N.—Mrs. D. M. Fairweather, Fen Farm, Hitcham, Ipswich.
H.C.—517, 527.

Class 502.—*Rhode Island Red Utility Cocks or Cockerels.*

538 I. & Special.—John Kay, Alderwood, Edenfield, Manchester.
536 II. & R.N. for Special.—Sir Herbert Sharp, Bart., Morley P.F., Hasketon, Woodbridge.
532 III.—John Taylor, Heath Farm, Tiptree.
534 IV.—G. H. Muzzlewhite, Redlands, Tavistock.
530 R.N.—Capt. the Hon. C. K. Greenway, Stanbridge Earls P.F., Romsey, Hants.
H.C.—535, 539. C.—542, 544.

Class 503.—*Rhode Island Red Utility Hens or Pullets.*

550 I. & Special.—John Kay, Alderwood, Edenfield, Manchester.
549 II.—Sir Herbert Sharp, Bart., Morley P.F., Hasketon, Woodbridge.
559 III.—Dr. S. D. G. McEntire, Great Baddow Court, Chelmsford.
563 IV.—Walter Wright, Hoo House, Polesworth, Tamworth.
567 R.N.—Master & F. W. Hitchcock, Crossways House, Great Barton, Bury St. Edmunds.
H.C.—547, 551. C.—552, 560.

Class 504.—*Welsummer Utility Cocks or Cockerels.*

578 I., Special & Cup, & 578 R.N.—Amos Pickard, 18, Coventry Road, Cilvers Coton, Nuneaton.
576 II., R.N. for Special & R.N. for Cup.—Capt. E. Duckworth, Tinsley Green, Crawley.
579 III.—Harry Snowden, Tillotson Farm, Cononley, Keighley.
569 IV.—A. H. Fox-Brockbank, The Croft, Kirksanton, Millom.
H.C.—577. C.—574.

Class 505.—*Welsummer Utility Hens or Pullets.*

586 I., Special & Cup.—Roger Hargreaves, Abbeydene P.F., Whalley, Lancs.
581 II., R.N. for Special & R.N. for Cup.—Mrs. A. M. Pape, Forest Lodge P.F., Binfield, Bracknell.
588 III.—Harry Snowden, Tillotson Farm, Cononley, Keighley.
580 IV.—James D. Orr, Gargunnock, by Stirling.
582 R.N.—Amos Pickard, 18, Coventry Road, Chilvers Coton, Nuneaton.
H.C.—585. C.—587.

Class 506.—*Utility Light Cocks or Cockerels, any other variety.*

589 I.—Col. Humphrey Watts, O.B.E., Haslington Hall, Crewe. Minorca.
591 II.—J. H. Baker & Son, Windyash, Barnstaple. Ancona.
592 III.—A. Rice, Wollaston, Wellingborough. Ancona.
590 IV.—The Hon. Z. & S. Maxwell, Layer P.F., Layer-de-la-Haye, Colchester. Bresse.

Class 507.—*Utility Light Hens or Pullets, any other variety.*

593 I.—E. R. Pease, Croft House, Croft-on-Tees, Darlington. Minorca.
598 II.—A. Rice, Wollaston, Wellingborough. Ancona.
594 III.—The Hon. Z. & S. Maxwell, Layer P.F., Layer-de-la-Haye, Colchester. Bresse.
595 IV.—Col. Humphrey Watts, O.B.E., Haslington Hall, Crewe. Minorca.
596 R.N.—J. H. Baker & Son, Windyash, Barnstaple. Ancona.

Class 508.—*Utility Heavy Cocks or Cockerels, any other variety.*

600 I.—R. S. Marsden, Chatburn, Clitheroe. Australorp.
599 II.—Col. Humphrey Watts, O.B.E., Haslington Hall, Crewe. White Orpington.
601 III.—The Rev. F. A. Roughton, M.A., Galleywood Vicarage, Chelmsford. Dorking.

Class 509.—*Utility Heavy Hens or Pullets, any other variety.*

608 I.—Roger Hargreaves, Abbeydene P.F., Whalley, Lancs. Croad Langshan.
606 II.—Herbert Beilby, Craggs P.F., Stock Road, Billericay. Australorp.
605 III.—A. J. Major, Ditton, Langley, Bucks. Dorking.
603 IV.—R. S. Marsden, Chatburn, Clitheroe. Australorp.

Class 510.—*Utility Light Hens.*[1]

614 I.—John A. Dewar, Homestall P.F., East Grinstead. White Leghorn.
611 II.—G. Hodson, The Kerr P.F., Kerr Street, Blackley, Manchester. White Leghorn.
616 III.—B. Stimson, Crofts Place, Little Saxham, Bury St. Edmunds. White Leghorn.
610 IV.—Ernest O. Gates, Hattondale P.F., Stanwick, Wellingborough. White Leghorn.
618 R.N.—Capt. F. C. Collins, Lawshall, Bury St. Edmunds. White Leghorn
H.C.—615. C.—609.

Class 511.—*Utility Heavy Hens.*[1]

630 I.—Thomas Leyson, Forward Green, Stowmarket. Rhode Island Red.
619 II.—John A. Dewar, Homestall P.F., East Grinstead. White Wyandotte.
618 III.—Dr. S. D. G. McEntire, Great Baddow Court, Chelmsford. Light Sussex.
621 IV.—J. D. Beak, Maiden Bradley, Frome. White Wyandotte.
628 R.N.—Richard Moore, Hammer House, Sutton Bridge, Wisbech. Rhode Island Red.
H.C.—617, 626, 629. C.—627.

Class 512.—*Utility Breeding Pens. Any Variety Light Breed.*

631 I.—Col. Humphrey Watts, O.B.E., Haslington Hall, Crewe. White Leghorn.
634 II.—Capt. F. C. Collins, Lawshall, Bury St. Edmunds. White Leghorn.
633 III.—Mrs. Joan K. Bateson, Lucas Green Manor, West End, Chobham, Surrey. Brown Leghorn.
632 IV.—The Hon. Z. & S. Maxwell, Layer P.F., Layer-de-la-Haye, Colchester. White Bresse.

Class 513.—*Utility Breeding Pens. Any Variety Heavy Breed.*

639 I.—Col. Humphrey Watts, O.B.E., Haslington Hall, Crewe. White Wyandotte.
642 II.—J. W. Spurgeon, 85, Bury Street, Stowmarket. White Wyandotte.
641 III.—Capt. F. C. Collins, Lawshall, Bury St. Edmunds. Rhode Island Red.
637 IV.—Mrs. M. A. Slater, Corden Hall, Stansfield, Clare, Suffolk. White Wyandotte.

Class 514.—*Aylesbury, Pekin or Rouen Drakes.*

647 I.—James Huntly & Son, Hirsel P.F., Coldstream. Aylesbury.
648 II. & 644 IV.—Reginald Appleyard, Priory Waterfowl Farm, Ixworth, Bury St. Edmunds. Rouen.
649 III.—James Longson & Sons, Buxton Road, Chapel-en-le-Frith. Aylesbury.
645 R.N.—Mrs. K. Amsden, Oaklawn P.F., Hildenborough, Tonbridge. Aylesbury.

Class 516.—*Indian Runner Drakes or Ducks, bred prior to* 1934.

653 I. & 660 II.—H. Hough-Watson, Braystones House, Beckermet.
658 III. & 654 IV.—The Rev. John Wilson, The Rectory, Brougham, Penrith.
652 R.N.—H. Whitley, Primley, Paignton, Devon.
H.C.—650, 657. C.—655.

Class 517.—*Indian Runner Drakes or Ducks, bred in* 1934.

665 I.—The Rev. J. Hewetson, Burbage Vicarage, Buxton.
664 II.—Mrs. W. G. Jacka, Ninnis, Germoe, Marazion.
663 III. & 666 IV.—Reginald Appleyard, Priory Waterfowl Farm, Ixworth, Bury St. Edmunds.

Class 518.—*Drakes, any other variety.*

678 I.—Harry Abbot, Premier Live Stock Farm, Reymerston, Norfolk. Muscovy.
677 II.—Wm. Richardson, 40, Bootham Crescent, York. Cayuga.
675 III.—James Huntly & Son, Hirsel P.F., Coldstream. Buff Orpington.
670 IV.—A. J. Major, Ditton, Langley, Bucks. Muscovy.
668 R.N.—John H. Butler, Gatcombe, Flax Bourton, Bristol. Khaki Campbell.
H.C.—667, 676. C.—669.

Class 519.—*Ducks, any other variety.*

686 I.—Wm. Richardson, 40, Bootham Crescent, York. Cayuga.
679 II.—John H. Butler, Gatcombe, Flax Bourton, Bristol. Khaki Campbell.
682 III.—James Huntly & Son, Hirsel P.F., Coldstream. Buff Orpington.
683 IV.—A. H. Fox-Brockbank, The Croft, Kirksanton, Millom. Muscovy.
H.C.—684, 685. C.—681.

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[1] Classes 510 and 511 are for birds that have secured the Copper Ring issued by the National Poultry Council, and Exhibits must wear the ring to be eligible to compete.

Class 520.—*Embden Ganders or Geese.*

694 I.—Abbot Bros., East of England Live Stock Farm, Thuxton, Norfolk.
696 II.—Harry Abbot, Premier Live Stock Farm, Reymerston, Norfolk.
692 III. & 687 R.N.—Reginald Appleyard, Priory Waterfowl Farm, Ixworth Bury St Edmunds.
688 IV.—A. H. Fox-Brockbank, The Croft, Kirksanton, Millom.
H.C.—690. C.—693.

Class 521.—*Toulouse Ganders or Geese.*

701 I.—Abbot Bros., East of England Live Stock Farm, Thuxton, Norfolk.
697 II.—H. Whitley, Primley, Paignton, Devon.
699 III.—Mrs. K. Amsden, Oak Lawn P.F., Hildenborough, Tonbridge.
702 IV.—W. G. Watson, Rusper Road, Horsham.
703 R.N.—Reginald Appleyard, Priory Waterfowl Farm, Ixworth, Bury St. Edmunds.
H.C.—698.

Class 522.—*Turkey Cocks.*

707 I. & 713 IV.—E. P. Woollatt, Duntons Farm, Lavenham, Suffolk.
712 II.—Horace Woollatt, Grove Farm, Flamstead, St. Albans.
708 III.—Harry Abbot, Premier Live Stock Farm, Reymerston, Norfolk.
711 R.N.—Frank S. Peele, Rookery Farm, Thuxton, Norfolk.
H.C.—705, 710, 714. C.—709.

Class 523.—*Turkey Hens.*

724 I.—H. Whitley, Primley, Paignton, Devon.
727 II.—Abbot Bros., East of England Live Stock Farm, Thuxton, Norfolk.
723 III.—E. P. Woollatt, Duntons Farm, Lavenham, Suffolk.
725 IV.—Herbert Bennett, Turkey Farm, Braiseworth, Eye, Suffolk.
729 R.N.—Harry Abbot, Premier Live Stock Farm, Reymerston, Norfolk.
H.C.—716, 721, 722. C.—728.

Class 524.—*Modern Game Bantam Cocks or Cockerels.*

731 I.—E. M. Peto, Bank House, Halesworth, Suffolk.
735 II.—Fred Pickering, Hebaldstowe, Wansford Road, Driffield.
734 III.—T. T. Fawcett, Wayside, Leyburn, Yorks.
733 IV.—Capt. I. Webster, Sellardale Hall, West Field, Wyke, Bradford.
732 R.N.—R. S. Marsden, Chatburn, Clitheroe.

Class 526.—*Old English Game Bantam Cocks or Cockerels.*

741 I.—Sidney Newton, 5, Mill Street, Mansfield.
740 II.—H. Whitley, Primley, Paignton, Devon.
737 III.—R. S. Marsden, Chatburn, Clitheroe.
738 IV.—C. Grange, Chedburgh, Bury St. Edmunds.
742 R.N.—Capt. E. Giles Bates, Heatheridge, Humshaugh.

Class 527.—*Old English Game Bantam Hens or Pullets.*

749 I.—H. Whitley, Primley, Paignton, Devon.
747 II.—Rhys Llewellyn, St. Fagan's Court, Glamorgan.
751 III.—Sidney Newton, 5, Mill Street, Mansfield.
748 IV.—C. Grange, Chedburgh, Bury St. Edmunds.
750 R.N.—Capt. E. Giles Bates, Heatheridge, Humshaugh.
H.C.—745. C.—743.

Class 528.—*Wyandotte Bantam Cocks or Cockerels.*

753 I.—H. Hough-Watson, Braystones House, Beckermet.
752 II.—Daniel Ashcroft, Lympstone, Berechurch, Colchester.
754 III.—Isaac Murfin, 121, Nuttall's Park, Ripley, Derby.
755 IV.—W. H. Silk, Courts Wynde, Haslemere.

Class 530.—*Sebright Bantam Cocks or Cockerels.*

756 I. & 759 III.—T. H. Sheldon, The Grove, Cropwell Butler, Nottingham.
757 II.—Robert Bennett, The Butts, Frome.
760 IV.—Wm. Richardson, 40, Bootham Crescent, York.

Class 532.—*Rhode Island Red Bantam Cocks or Cockerels.*

766 I. & Special.—John Kay, Alderwood, Edenfield, Manchester.
764 II.—H. Duffield, Market Weighton, Yorks.
763 III.—J. T. Wright, Prospect House, Hemingbrough, Selby.
761 IV.—Capt. the Hon. C. K. Greenway, Stanbridge Earls P.F., Romsey, Hants.
765 R.N.—Mrs. F. M. Heathfield, The Vale P.F., Plungar, Nottingham.

Class 533.—*Rhode Island Red Bantam Hens or Pullets.*

771 I. & Special.—J. T. Wright, Prospect House, Hemingbrough, Selby.
772 II.—H Duffield, Market Weighton, Yorks.
770 III.—Mrs. F. M. Heathfield, The Vale P.F., Plungar, Nottingham.
767 IV.—Capt. the Hon. C. K. Greenway, Stanbridge Earls P.F., Romsey, Hants.
768 R.N.—William Foote, Fir Tree Farm, Snow Hill, Crawley Down.

Class 534.—*Bantam Cocks or Cockerels, any other variety.*

775 I.—H. Hough-Watson, Braystones House, Beckermet. White Polish.
773 II.—John A. Dewar, Homestall P.F., East Grinstead. Japanese.
778 III.—Mrs. H. A. Clive, The Hill House, Hartpury, Gloucester. Indian Game.
774 IV.—R. Smy, 48, Beck Street, Ipswich. Black Rosecomb.
776 R.N.—Fred Swindells, Diglake Dairy Farm, Buglawton, Cheshire. Pekin.
H.C.—780. C.—779.

Class 535.—*Bantam Hens or Pullets, any other variety.*

782 I.—Major G. T. Williams, Tredrea, Perranwell, Cornwall. Japanese.
788 II.—Major G. T. Williams. Polish.
785 III.—R. Smy, 48, Beck Street, Ipswich. Black Rosecomb.
789 IV.—Frank E. Entwistle, Forest Lodge P.F., Binfield, Bracknell. Barnevelder.
784 R.N.—J. H. Baker & Son, Windyash, Barnstaple.
H.C.—790. C.—791.

FARM AND DAIRY PRODUCE OF THE UNITED KINGDOM.

The Prizes in each Class for Butter are as follows: First Prize, £3; Second Prize, £2; Third Prize, £1; Fourth Prize, 10s.; Fifth Prize, 5s.

Butter.

Class 536.—*Two pounds of Fresh Butter, without any salt, made up in plain pounds, from the milk of Channel Island, Devon or South Devon Cattle and their crosses.*

1 I.—His Majesty the King, Sandringham, Norfolk.
18 II.—Mrs. John Way, West Bridge, Bishops Nympton, South Molton.
2 III.—Mrs. E. B. Beer, Puddaven, Totnes, Devon.
3 IV.—Mrs. G. E. Blackler, West Leigh, Modbury, Devon.
12 V.—Miss M. M. Varker, Fraddam, Gwinear, Hayle, Cornwall.
6 R.N.—Mrs. B. Dennis, Pulworthy, Highampton, Beaworthy, Devon.
H.C.—5, 14.

Class 537.—*Two pounds of Fresh Butter, without any salt, made up in plain pounds, from the milk of cattle of any breed or cross other than those mentioned in Class 536.*

16 I.—E. B. Beer, Puddaven, Totnes, Devon.
17 II.—A. G. Dennis, Lower Pulworthy, Highampton, Beaworthy, Devon.
20 III.—Miss P. L. Mudd, Slade House, Darley, Harrogate.
21 R.N.—Mrs. S. Robinson, Red House Farm, Aldham, Hadleigh.

Class 538.—*Two pounds of Fresh Butter, slightly salted, made up in plain pounds, from the milk of Channel Island, Devon or South Devon Cattle and their crosses.*

24 I.—Mrs. G. E. Blackler, West Leigh, Modbury, Devon.
36 II.—Miss M. M. Varker, Fraddam, Gwinear, Hayle, Cornwall.
37 III.—Mrs. John Way, West Bridge, Bishops Nympton, South Molton.
27 IV.—Mrs. B. Dennis, Pulworthy, Highampton, Beaworthy, Devon.
31 V.—J. Pierpont Morgan, Wall Hall, Aldenham, Watford.
22 R.N.—His Majesty the King, Sandringham, Norfolk.
H.C.—23, 26, 30, 32.

Class 539.—*Two pounds of Fresh Butter, slightly salted, made up in plain pounds, from the milk of cattle of any breed or cross other than those mentioned in Class 538.*

40 I.—E. B. Beer, Puddaven, Totnes, Devon.
41 II.—A. G. Dennis, Lower Pulworthy, Highampton, Beaworthy, Devon.
45 III.—Miss P. L. Mudd, Slade House, Darley, Harrogate.
46 R.N.—Mrs. S. Robinson, Red House Farm, Aldham, Hadleigh.

Class 540.—*Three pounds of Fresh Butter, slightly salted, made up in pounds in the most attractive marketable designs.*

47 I.—His Majesty the King, Sandringham, Norfolk.
54 II.—Miss M. M. Varker, Fraddam, Gwinear, Hayle, Cornwall.
48 III.—Mrs. E. B. Beer, Puddaven, Totnes, Devon.
50 IV.—Mrs. J. Moggford, Overcott, Rose Ash, South Molton.
51 R.N.—J. Pierpont Morgan, Wall Hall, Aldenham, Watford.
H.C.—52, 55.

Cheese.

Made in 1934

Unless otherwise stated the Prizes in each Class for Cheese are as follows; First Prize, £5 ; Second Prize, £3 ; Third Prize, £2 ; Fourth Prize, 10s. : Fifth Prize, 5s.

Class 541.—*Two Cheshire Cheeses, coloured, not less than 40 lb. each.*

62 I.—A. E. Walley, Bickerton Hall, Malpas.
64 II.—Thomas W. Young, Sicilly Oak Farm, Cholmondeley, Malpas.
59 III.—Hugh Lancaster, The Creamery, Saighton, Chester.
63 IV.—H. S. & W. G. Whittaker, Wardle Bridge Farm, Nantwich.
56 R.N.—Thomas E. Beckett, Hall o' Coole, Nantwich.

Class 542.—*Two Cheshire Cheeses, uncoloured, not less than 40 lb. each.*

73 I.—Thomas W. Young, Sicilly Oak Farm, Cholmondeley, Malpas.
69 II.—Hugh Lancaster, The Creamery, Saighton, Chester.
70 III.—Ruyton Co-operative Dairies, Ltd., Ruyton-XI-Towns, Shropshire.
71 IV.—A. E. Walley, Bickerton Hall, Malpas.
65 R.N.—Thomas E. Beckett, Hall o' Coole, Nantwich.

Class 543.—*Two Cheddar Cheeses, not less than 50 lb. each.*

78 I.—B. H. J. W. White, Hill View Farm, Bruton, Somerset.
77 II.—Frank Portch, Leigh Farm, Wincanton, Somerset.
79 III.—Sidney T. White, Stock Dennis Farm, Ilchester, Somerset.
76 R.N.—H. H. Pickford, Patney, Devizes, Wilts.

Class 544.—*Two Cheddar Truckles.*

86 I.—B. H. J. W. White, Hill View Farm, Bruton, Somerset.
82 II.—Mrs. S. A. Harris, Glenusk, Nantyderry, Abergavenny.
84 III.—H. H. Pickford, Patney, Devizes, Wilts.
85 R.N.—Frank Portch, Leigh Farm, Wincanton, Somerset.

Class 545.—*Two Leicestershire Cheeses.*

94 I.—Tuxford & Tebbutt, Ltd., Thorpe End, Melton Mowbray.
92 II.—Francis W. Tomlinson, Hall Farm, Ullesthorpe, Rugby.
93 III.—Stephen Truelove, Gate Farm, Monks Kirby, Rugby.
89 R.N.—P. J. Haynes, Home Farm, Ashby Parva, Rugby.
H.C.—91.

Class 546.—*Two Stilton Cheeses.*

99 I.—J. M. Nuttall & Co., Ltd., Dove Dairy, Hartington, Buxton.
97 II.—Long Clawson Dairy, Ltd., Hose, Melton Mowbray.
98 III.—Long Clawson Dairy, Ltd., Long Clawson, Melton Mowbray.

Class 547.—*Two Wensleydale Cheeses, Stilton shape.*

103 I.—Alfred Rowntree & Son, Coverham, Middleham, Yorks.
101 II.—Mrs. S. A. Harris, Glenusk, Nantyderry, Abergavenny.
102 III.—Miss Betty J. Mudd, Aldborough Dairy, Boroughbridge, Yorks.

Class 548.—*Two Caerphilly Cheeses.*

111 I.—Monmouthshire Agricultural Institute, Usk.
110 II.—Miss Mary Lee, Ruthin Farm, St. Mary Hill, Pencoed, Bridgend.
112 III.—South Western Dairies, Ltd., Sherborne, Dorset.
104 R.N.—Cheddar Valley Dairy Co., Ltd., Rooksbridge, Axbridge.
H.C.—107.

Class 549.—*Two Small Cheeses, not exceeding* 6 *lb. each, of Cheddar or Cheshire character.*

124 I. £4.—Sidney T. White, Stock Dennis Farm, Ilchester, Somerset.
119 II. £2.—Frank Portch, Leigh Farm, Wincanton, Somerset.
115 III. £1.—Mrs. S. A. Harris, Glenusk, Nantyderry, Abergavenny.
120 IV. 10s.—Ruyton Co-operative Dairies, Ltd., Ruyton-XI-Towns, Shropshire.
114 V. 5s.—East Anglian Institute of Agriculture, Chelmsford.
118 R.N.—H. H. Pickford, Patney, Devizes, Wilts.

Class 550.—*Two Small Cheeses, not exceeding* 6 *lb. each, of Stilton or Wensleydale character.*

130 I. £4.—J. M. Nuttall & Co., Ltd., Dove Dairy, Hartington, Buxton.
132 II. £2.—Webster & Richardson, Hickling Lodge, Kinoulton, Notts.
128 III. £1.—Long Clawson Dairy, Ltd., Long Clawson, Melton Mowbray.
127 R.N.—Long Clawson Dairy, Ltd., Hose, Melton Mowbray.

Class 551.—*Two Soft Cheeses, made from whole milk.*

134 I. £4.—Miss E. M. Allday, Fotheringhay Manor, Peterborough.
135 II. £2.—Berridge Bros., Little Common, Sawtry, Peterborough.
137 III. £1.—East Anglian Institute of Agriculture, Chelmsford.
136 R.N.—Mrs. C. C. Courtauld, Froyz Hall, Halstead, Essex.

Class 552.—*Two Cheeses made from cream without the addition of rennet.*

145 I. £4.—Mrs. V. Morse, Upper Cowden, Five Ashes, Sussex.
147 II. £2.—Mrs. Herbert Okeden, Stutton House, Stutton, Ipswich.
148 III. £1.—Mrs. B. Pinning, Lusby, Spilsby, Lincs.
142 IV. 10s.—Mrs. C. C. Courtauld, Froyz Hall, Halstead, Essex.
143 R.N.—Mrs. H. Crosby, Auburn House, West Rounton, Northallerton.

Cider.

The Prizes in each Class for Cider are as follows: First Prize, £3; Second Prize, £2; Third Prize, £1; Fourth Prize, 10s.

Class 553.—*Casks of Cider, not less than* 6 *gallons, made in* 1933 *by a bona-fide Farmer.*

150 I.—Herbert W. Davis, Sutton Montis, Yeovil, Somerset.
153 II.—Ridler & Son, Clehonger Manor, Hereford.
154 III.—H. Sealy & Son, Honeyhurst Farm, Rodney Stoke, Cheddar, Somerset.

Class 554.—*Six Bottles of Dry Cider, made in* 1933.

160 I.—Gloucestershire Cider Co., Ltd., Wickwar, Glos.
162 II.—Pullin Bros., Spaniorum Farm, Compton Greenfield, Bristol.
159 III. & 158 IV.—Herbert W. Davis, Sutton Montis, Yeovil, Somerset.
C.—156, 163.

Class 555.—*Six Bottles of Sweet Cider, made in* 1933.

185 I.—H. Sealy & Son, Honeyhurst Farm, Rodney Stoke, Cheddar, Somerset.
175 II.—Reginald J. J. Denning, Little Ashwell Farm, Ilminster, Somerset.
184 III.—B. Rogers, Wreath Farm, Chard, Somerset.
174 IV.—Herbert W. Davis, Sutton Montis, Yeovil, Somerset.
187 R.N.—Severn Vale Cider Co., Ltd., Bushley, Gloucester.
H.C.—181, 188. C.—170, 176, 178.

Class 556.—*Six Bottles of Cider, made previous to* 1933.

194 I.—Ridler & Son, Clehonger Manor, Hereford.
199 II. & 198 III.—Stanley J. Sheppy, Three Bridges, Taunton.
C.—191, 197.

Wool.[1]

Of 1934 clip.

First Prize, £3; Second Prize, £2; Third Prize, £1, in each Class.

Class 557.—*Three Fleeces of Oxford Down Wool.*

202 I. & 203 III.—H. W. Stilgoe, The Grounds, Adderbury, Banbury.
201 II.—Lawrence B. Akers, Litchfield Farm, Enstone, Oxford.

[1] The Second and Third Prizes in these Classes were given by the respective Flock Book Societies.

Class 558.—*Three Fleeces of Shropshire Wool.*

206 I. & Special [1] & 207 II.—E. Craig Tanner, Eyton-on-Severn, Wroxeter, Shropshire.
205 III.—John Minton, Condover Grange, Shrewsbury.

Class 559.—*Three Fleeces of Southdown Wool.*

21 I. & 210 III.—Lady Ludlow, Luton Hoo, Luton.
216 II.—Joe K. Williamson, Derwen Hall, Corwen.
218 IV.—His Majesty the King, Sandringham, Norfolk.

Class 560.—*Three Fleeces of Hampshire Down Wool.*

221 I. & 220 III.—William Todd, Little Ponton Grange, Grantham.
218 II.—E. Clifton-Brown, Burnham Grove, Burnham, Bucks.

Class 561.—*Three Fleeces of Suffolk Wool.*

222 I. & R.N. for Special.[1]—A. H. Cobbald & C. A. Christmas, Acton Hall, Sudbury, Suffolk.
223 II.—Capt. R. S. Hall, New Hall, Tendring, Clacton-on-Sea.

Class 562.—*Three Fleeces of Dorset Down Wool.*

224 I.—The Earl of Elgin, K.T., Broomhall, Dunfermline.
226 II & 227 III.—Leonard Tory, Turnworth, Blandford.

Class 563.—*Three Fleeces of Dorset Horn Wool.*

231 I. & 230 III.—Alfred Read, Lower Farm, Hilton, Blandford.
229 II.—The Earl of Elgin, K.T., Broomhall, Dunfermline.

Class 564.—*Three Fleeces of Ryeland Wool.*

233 I., 234 II. & 232 III.—T. W. Montague Perkins, Ufton Court, Holme Lacy, Hereford

Class 565.—*Three Fleeces of Kerry Hill (Wales) Wool.*

237 I.—John T. Beaven, Winsbury, Chirbury, Montgomery.
238 II.—John W. Owens, Woodhouse, Shobdon, Herefordshire.

Class 566.—*Three Fleeces of Lincoln Wool.*

239 I. & 240 III.—D. F. Browett, Thornton, Horncastle.
241 II.—Clifford Nicholson, Willoughton Manor, Lincoln.

Class 568.—*Three Fleeces of Wensleydale Wool.*

244 I. & R.N. for Special.[2]—John Percival, Easthouse, Carperby, Yorks.
243 II.—John Wm. Greensit, Holme-on-Swale, Thirks.
246 III.—John A. Willis, Manor House, Carperby, Yorks.

Class 569.—*Three Fleeces of Kent or Romney Marsh Wool, from Rams of any age.*

248 I.—L. H. Finn, The Mall, Faversham, Kent.
250 II.—Ashley Stevens, Davington Hall, Faversham, Kent.
247 III.—E. W. Baker, Bekesbourne, Canterbury.

Class 570.—*Three Fleeces of Kent or Romney Marsh Wool, from Ewe Tegs.*

255 I.—Ashley Stevens, Davington Hall, Faversham, Kent.
251 II.—E. W. Baker, Bekesbourne, Canterbury.
252 III.—L. H. Finn, The Mall, Faversham, Kent.

Class 571.—*Three Fleeces of Kent or Romney Marsh Wool, excluding Rams and Ewe Tegs.*

259 I. & Special [2] & 257 II.—L. H. Finn, The Mall, Faversham, Kent.
256 III.—E. W. Baker, Bekesbourne, Canterbury.

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[1] Special Cash Prize, known as the "Merchants of the Staple of England" Prize, given for the best fleece taken from any short-woolled breed of sheep.

[2] Special Cash Prize, known as the "Merchants of the Staple of England" Prize, given for the best fleece taken from any long-woolled breed of sheep.

Class 572.—*Three Fleeces of Welsh Mountain Wool.*

264 I. & 263 III.—Major Eric J. W. Platt, Madryn Farm, Aber, Caernarvonshire.
265 II.—Joe K. Williamson, Derwen Hall, Corwen, North Wales.

Class 573.—*Three Fleeces of Black Welsh Mountain Wool.*

266 I. & 267 II.—Miss J. V. Horn, Woodcote Park, Blackshiels, Midlothian.
268 III.—Mrs. Jervoise, Herriard Park, Basingstoke.

BUTTER-MAKING COMPETITIONS.

Class 1.—*Open to Students who have attended a course at the East Anglian Institute of Agriculture, and who have uot won a First Prize at any Show.*

9 I. £4.—Miss E. G. Mills, 15, Inglis Road, Colchester.
10 II. £3.—Miss Evelyn Neeson, 17, Spratt Hall Road, Wanstead, Essex.
8 III. £2.—Miss E. A. Meredith, Meadowside House, Rectory Lane, Chelmsford.
1 IV. £1.—Miss Doreen M. Brown, Gaysham Hall, Barkingside, Ilford, Essex.
2 R.N.—Miss E. Calder, Moulsham Grange, London Road, Chelmsford.
H.C.—12.

Class 2.—*Open to Students who have received not less than one month's instruction at any Dairy School and who have not won a First or Second Prize at the R.A.S.E., London Dairy, Bath and West, Royal Counties, Royal Lancashire or Yorkshire Shows.*

29 I. £4.—Miss Winifred M. Reynolds, Wern-y-Cwm, Abergavenny.
30 II. £3.—Miss Elinar Roper, Roydon Hall, Ramsey, Harwich.
22 III. £2.—Miss Nesta M. Lewis, Monmouthshire Agricultural Institute, Usk.
15 IV. £1.—Miss Lily Bromley, Trethewey, Germoe, Marazion.
27 R.N.—Miss A. Price, Hynett, Lower Wilcroft, Hereford.
H.C.—14, 28.

Class 3.—*Open to those who have not won a First or Second Prize at any Show.*

41 I. £4.—Miss Winifred M. Reynolds, Wern-y-Cwm, Abergavenny.
33 II. £3.—Miss Myra Betts, New House Farm, Himbleton, Droitwich.
35 III. £2.—Miss Lily Bromley, Trethewey, Germoe, Marazion.
37 IV. £1.—Miss Nesta M. Lewis, Monmouthshire Agricultural Institute, Usk.
34 R.N.—Miss Daphne Bradshaw, Monmouthshire Agricultural Institute, Usk.
H.C.—40.

Class 4.—*Open, except to Champions at the R.A.S.E., London Dairy, Bath and West, Royal Counties, Royal Lancashire or Yorkshire Shows.*

Section A.

50 I. £5.—Miss Olga Eustice, Bezurrell, Gwinear, Hayle.
46 {Equal II. £2 10s.} Miss Lily Bromley, Trethewey, Germoe, Marazion.
49 {Equal II. £2 10s.} Miss M. A. Edwards, Humber Court, Leominster.
53 IV. £2.—Miss Flossie Lewis, Court Farm, Llanmartin, Newport, Mon.
54 V. £1.—Miss Nesta M. Lewis, Monmouthshire Agricultural Institute, Usk.
42 R.N.—Miss Emily Abbott, Red Rice Dairy, Andover.
H.C.—51.

Section B.

61 I. £5.—Miss P. E. Peer, Rectory Farm, Tibberton, Droitwich.
57 II. £4.—Miss A. Olive Mitchell, Penventinnie, Kenwyn, Truro.
62 III. £3.—Miss A. Price, Hynett, Lower Wilcroft, Hereford.
59 IV. £2.—Miss Monica M. Olde, Clifton House, Boscastle, Cornwall.
66 V. £1.—Miss Ray Williams, Court Farm, Llantarnam, Newport, Mon.
60 R.N.—Miss N. M. Paull, Leyonne Farm, Par, Cornwall.
H.C.—63. C.—64.

Class 5.—*Inter-County Championship for teams of three, one of whom must be a Novice never having won a First or Second Prize up to the time of entry, the second member must not have won more than three First Prizes and must never have won any Championship, the third member may be a Champion at this or any Show.*

67 I. £3 & Silver Medal each.— Miss Lily Bromley, Trethewey, Germoe, Marazion. / Miss N. M. Paull, Leyonne Farm, Par. / Miss A. Olive Mitchell, Penventinnie, Kenwyn, Truro.
71 II. £2 each.— Miss Winifred Reynolds, Wern-y-Cwm, Abergavenny. / Miss Flossie Lewis, Court Farm, Llanmartin, Newport, Mon. / Miss Ray Williams, Court Farm, Llantarnam, Newport, Mon.
73 III. £1 each.— Miss Myra Betts, New House Farm, Himbleton, Droitwich. / Miss Pearl Millichip, Cummins, Hindlip, Worcester. / Miss P. E. Peer, Rectory Farm, Tibberton, Droitwich.
68 R.N.— Miss Eunice Colman, Haske, Upper Hellions, Crediton. / Miss Muriel Mill, Thongsleigh, Cruwys Morchard, Tiverton. / Miss Rosa Hancock, New Barn, Kingsnympton, Umberleigh.
H.C.—70. C.—72.

Class 6.—*Championship open to the First Prize Winners in the preceding Classes or at any previous R.A.S.E. Show, and to Champions of the London Dairy, Bath and West, Royal Counties, or any County Show.*

76 I. £5 & Gold Medal.—Miss Rosa Hancock, New Barn, Kings Nympton, Umberleigh.
78 II. £4.—Miss Marie Julian, Tredinnick, Duloe, Cornwall.
58 III. £3.—Miss Flossie Lewis, Court Farm, Llanmartin, Newport, Mon.
77 IV. £2.—Miss Sybil E. Jones, Cwm, Crickhowell.
57 V. £1.—Miss A. Olive Mitchell, Penventinnie, Kenwyn, Truro.
46 R.N.—Miss Lily Bromley, Trethewey, Germoe, Marazion.
H.C.—79, 81.

FLOWER SHOW.

Class 1.—*Groups of Miscellaneous Plants.*

1 I. £40.—James Cypher & Sons, Ltd., Queen's Road Nurseries, Cheltenham.
3 II. £30.—T. M. Petch, Highfield Nursery, Great Horton, Bradford.

Class 2.—*Collections of Delphiniums.*

5 I. £6.—Hewitt & Co., Ltd., Solihull, Warwickshire.

Class 3.—*Groups of Tuberous Begonias in pots.*

7 I. £20.—Blackmore & Langdon, Bath.

Class 4.—*Groups of Aquatic and Semi-Aquatic Plants.*

10 I. £20.—M. Prichard & Sons, Ltd., Riverslea Nurseries, Christchurch, Hants.
10a II. £15.—Stephens Sims, Draycott, Derbyshire.
9 III. £10.—Hillier & Sons, Winchester.
8 IV. £5.—Lt.-Col. C. H. Grey, D.S.O., Hocker Edge Gardens, Cranbrook, Kent.

Class 5.—*Collections of Hardy Perennial Plants and Cut Blooms.*

16 I. £30.—Suffolk Seed Stores, Ltd., Woodbridge.
11 II. £25.—Wm. Artindale & Son, Nether Green, Sheffield.
15 III. £20.—M. Prichard & Sons, Ltd., Riverslea Nurseries, Christchurch, Hants.
H.C.—14. C.—13.

Class 6.—*Collections of Tree Carnations.*

17 I. £15 & Cup.[1]—C. Engelmann, Ltd., Saffron Walden.
18 II. £10.—Stuart Low & Co., Bush Hill Park, Enfield.

Class 8.—*Collections of Sweet Peas.*

20 I. £15.—Ralph Challinor, The Gardens, Lilleshall, Wellington, Shropshire.
19 II. £10.—G. H. Brookshaw, Stock Lane, Hough, Crewe.

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[1] Perpetual Challenge Cup awarded to the First Prize Winner in Class 6.

Class 9.—*Collections of Cut Roses.*

29 I. £15.—THOMAS ROBINSON, Porchester Nurseries, Nottingham.
25 II. £10.—C. GREGORY, Old Close Nurseries, Chilwell, Nottingham.
28 III. £7.—D. PRIOR & SON, LTD., Colchester.
24 IV. £5.—BENJAMIN R. CANT & SONS, LTD., The Old Rose Gardens, Colchester.

Exhibits not for Competition.

Large Gold Medals to :—

35 FRANK CANT & CO., LTD., Braiswick Rose Gardens, Colchester. Cut Roses.
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INDEX TO VOLUME 95.

1934

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